Rock Products

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A Big Plant with a Bigger Quarry

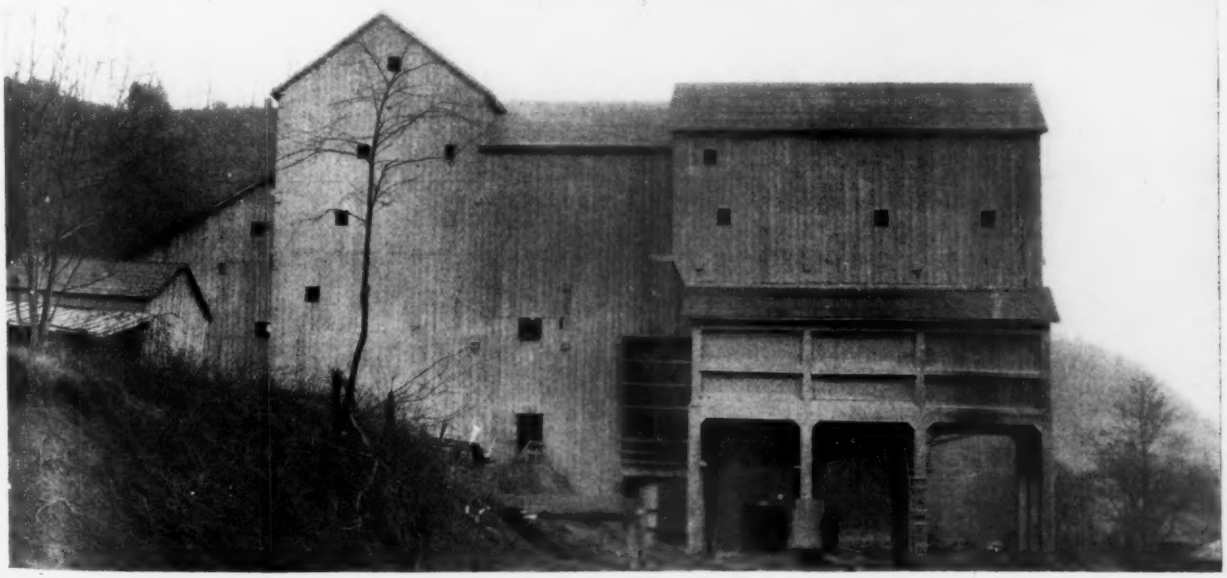
Pembroke Limestone Corporation, Pembroke, Va., Has an Unusual Crushing, Screening and Washing Layout and Produces 1800 Tons Daily — Quarry Worked in Two Faces

By George M. Earnshaw

THE Pembroke Limestone Corporation, Pembroke, Va., is referred to locally, and by those who are familiar with the rock products industries of that section, as "one of the W. W. Boxley plants." This is because Mr. Boxley is a part owner of this operation as he also is of two others—one at Pounding Mill and the other at Blue Ridge Springs, Va. At each plant, in the capacity of general superintendent and manager, is Mr. Boxley's partner. Each superintendent has a half interest in the plant he operates. At the Pounding Mill plant, Major C. M. Hunter is in charge and at the Blue Ridge Springs plant, J. B. Dunkin directs the operation. A. W. Lumsden is superintendent at the Pembroke plant.

The three crushing plants are built very much along the same lines, but at each one there are special features designed to take care of certain local conditions. As nearly as possible they are operated in the same

East face of the quarry. This was taken after the steam shovel had made three complete trips through the rock brought down by the big shot described



Crushing plant from the east. The new washing plant has been erected at the right-hand side beyond the bins

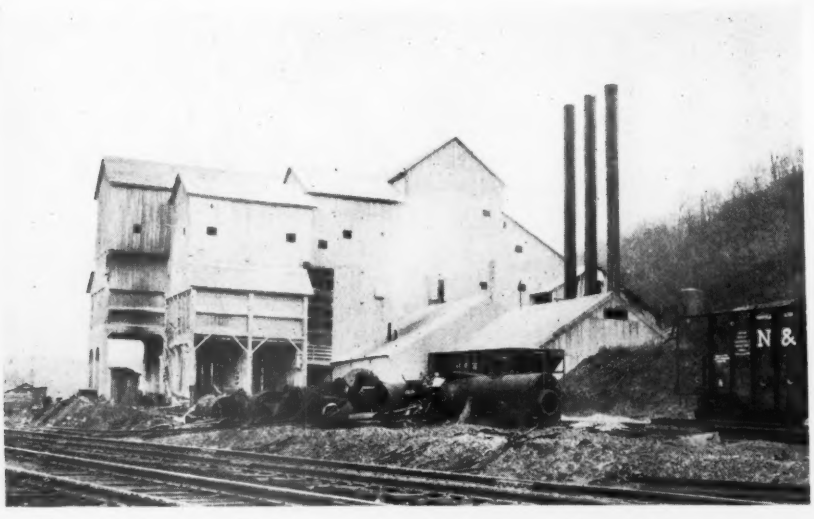
manner and all are approximately of the same capacity.

The Pembroke plant is located on the main line of the Norfolk & Western railroad, approximately 60 miles from Roanoke, Va. This is considered an advantageous location insofar as it affords the company an oversize market without getting off of the main line of the road directly serving the plant. This market represents a distance of 150 miles in either direction from the plant.

The plant proper is of an unusual design and is equipped in such a way that practically any variety of sizes can be produced. This is because there are four distinct screening operations and a battery of three secondary crushers. Although the plant is not designed for gravity operation, it has only two elevators and two conveyors.

Tracks from the quarry come into the plant above the level of the primary crusher —a No. 12 Allis-Chalmers. Here cars that have been loaded too heavy on the wrong side are dumped by means of compressed-air hoists equipped with hooks. The hook attachment permits pulling the car bodies back after they have dumped.

How the plant looks from the quarry. The spur track going to the right is for bringing coal to the upper side of plant



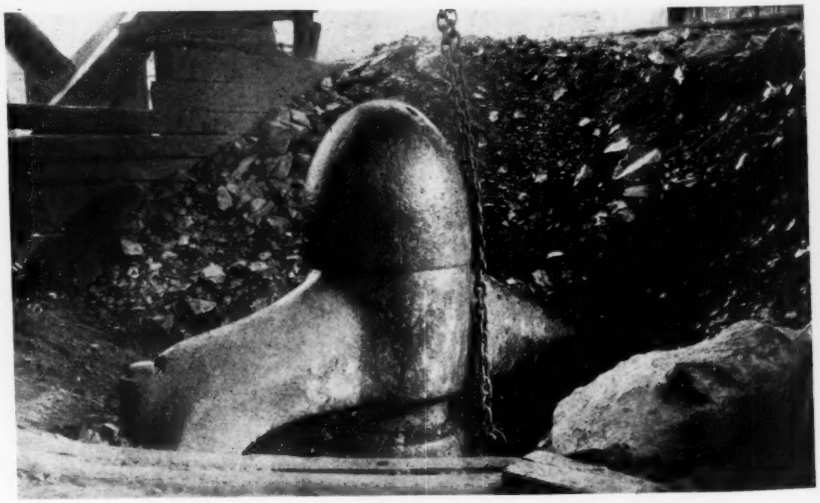
West side of plant. Picture was taken before the washing plant was erected

The No. 12 is set to discharge at 4 in. and its product empties into a 36-in. belt-bucket elevator of 70-ft. centers inclined at approximately 75 deg. A 60-in. scalping screen, 12 ft. long, receives the material from the elevator. This screen is made up of three sections, all of which have 2¼-in. perforations. Material passing through this screen is sent to the washing plant.

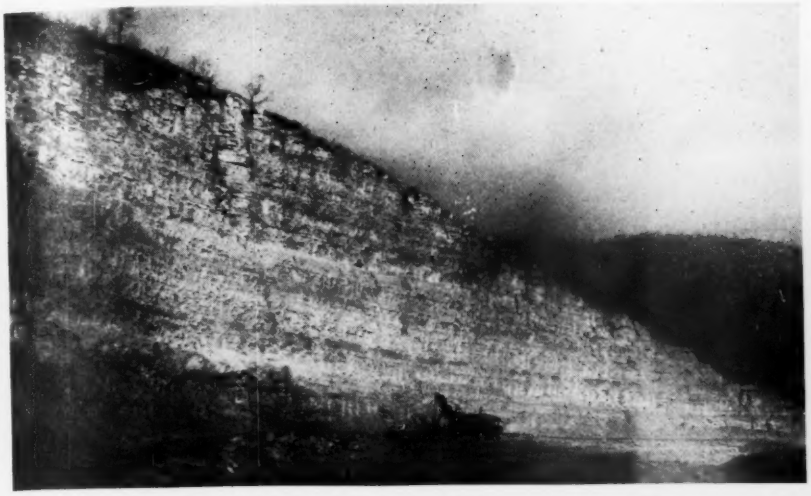
The Washing Plant

Foundations for the washing plant were being poured at the time of the writer's visit several months ago and publication of this article has been postponed until Mr. Lumsden could give us a description of the new addition and a report of how it functions. This information, together with the accompanying drawings, came in the form of a letter recently; the following is the text of Mr. Lumsden's letter in part:

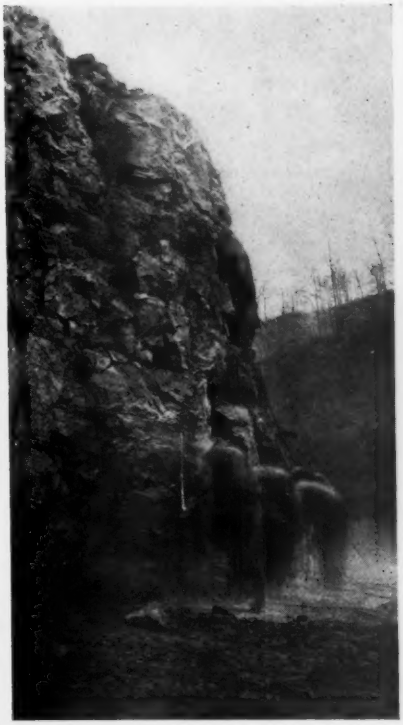
"In regard to the washing plant which has been put in operation since you were here, we are glad to advise it is very successful. As you know, in our original plant we have a 60-in. scalper for removing the smaller stone and foreign materials. This material drops directly into a bin, from which it is taken by belt-conveyor to the washing plant, where it is discharged into a 60-yd. bin. From this bin the stone is fed by an apron feeder into an 8x10-ft. scrubber. The purpose of having the storage bin over the apron feeder is to regulate the flow of stone so that the plant may not at any time become fluctuated on account of dumping dirty fine stone in the primary crusher. We find this is very successful as the volume at times coming from the crusher is 100 tons per hour and an average of 600 yd. per 10 hr. So in having this storage bin, we



The primary (No. 12) gyratory crusher. Rock from this goes to a scalping screen and the reject of this screen goes to three No. 6 gyratories

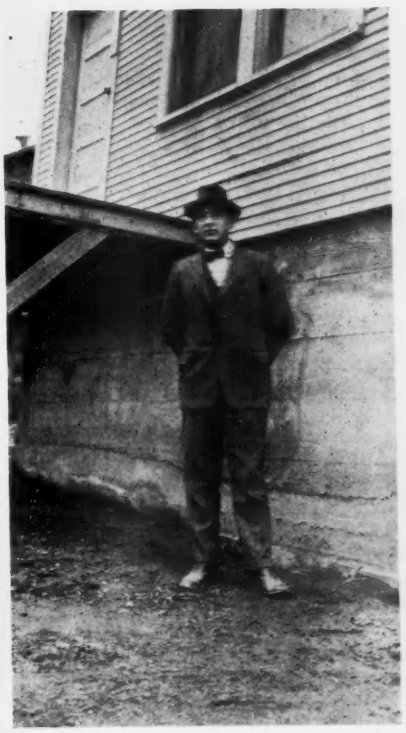


West face of quarry. There are two parallel faces; each is 1300 ft. long and averages 150 ft. in height



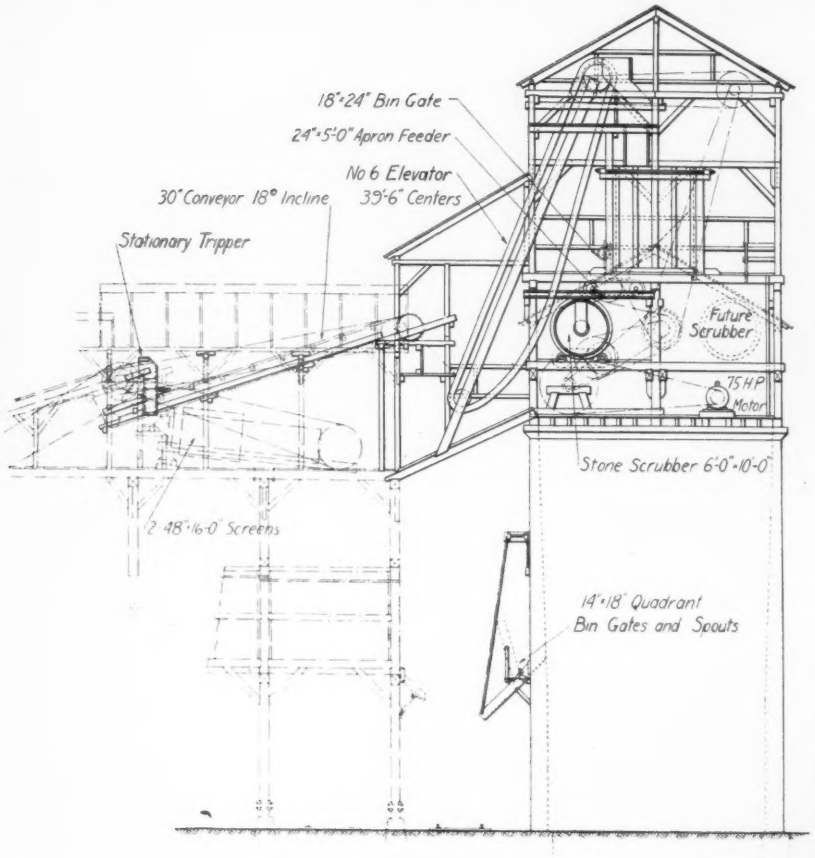
Putting down bench holes with jack-hammers. The figures are blurred in the photograph by the vibration from the drills

One of the shovels completing a windrow, ready to turn around and go back through the broken rock



A. W. Lumsden, general superintendent and manager, who also owns a half interest in the operation

The scale house. All of the output of the plant passes over these track scales



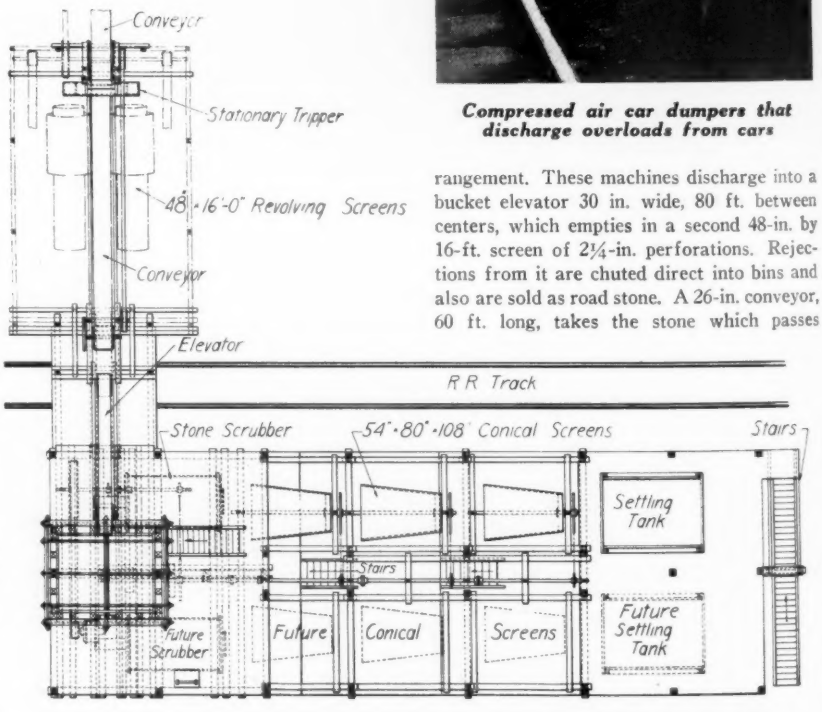
End elevation of the new washing plant

have a gradual, uniform flow of stone to the washer which is not affected by delays at the crusher or in the quarry such as an oversize boulder or a derailed car.

"We have an adequate supply of water furnished by a centrifugal pump. This unit has a 6-in. suction and 5-in. discharge and is directly connected to a 125-hp. motor; it furnishes 1200 g.p.m. to the scrubber and screens. Before the stone leaves the scrubber it has been thoroughly scrubbed by passing over a number of staggered baffles.

From the scrubber the stone discharges into a 54x80x180-in. conical screen in which we have a 2-in. stream of water under high pressure which rinses the stone before it is discharged. There are three conical screens, in tandem, and each one is equipped with a nozzle carrying an adequate supply of water to thoroughly clean the stone before discharging it.

"The fines are carried to an 8x12x5-ft. box-type settling tank which is dumped by hand when it becomes full. This product, of course, is a clean grade of sand for which we have an excellent market. We consider the plant a very successful installation, inasmuch as we are saving a large quantity of small stone that formerly was wasted as "screenings"; also, our washing unit permits us to furnish our customers with a perfectly clean stone at all times, regardless of whether or not we are encountering mud pockets in the quarry. The new addition was designed and its equipment furnished by Allis-Chalmers Mfg. Co. In designing it provision was made for the future installation of additional equipment to parallel the present layout so that the capacity can be easily doubled."



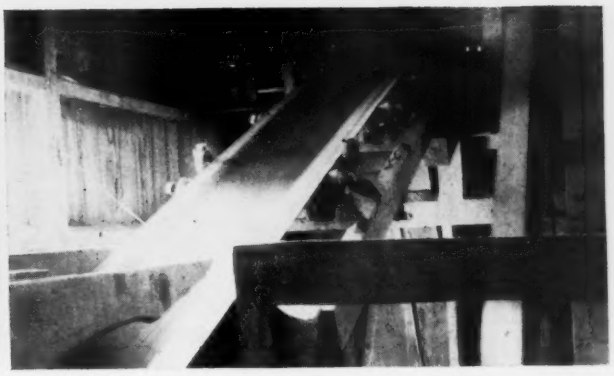
Plan of present washing plant showing arrangement for future extensions

Original Plant

Rejections from the scalping screen are moved by gravity to three No. 6 Allis-Chalmers crushers, mounted on the same level as that of the No. 12, and in a triangular arrangement. These machines discharge into a bucket elevator 30 in. wide, 80 ft. between centers, which empties in a second 48-in. by 16-ft. screen of 2¼-in. perforations. Rejections from it are chuted direct into bins and also are sold as road stone. A 26-in. conveyor, 60 ft. long, takes the stone which passes

Compressed air car dumpers that discharge overloads from cars

The 60-ft. by 12-in. scalping screen which takes the output of the No. 12 gyratory crusher



This conveyor takes the undersize of the scalping screen to the washing plant

through this screen to a pair of 48-in. by 24-ft. revolving screens with 1-in. perforations, which are equipped with dust jackets, 11 ft. long with ¼-in. perforations. The product of each screen is individually binned and the oversize is chuted to the road material bins.

The plant is driven by steam power and all the machinery drives from one main line shaft. Three 200-hp. return flue tubular Erie boilers supply a 330-hp. Corliss engine and also two Ingersoll-Rand air compressors which provide the quarry equipment as well as miscellaneous pieces of air-driven equipment about the plant.

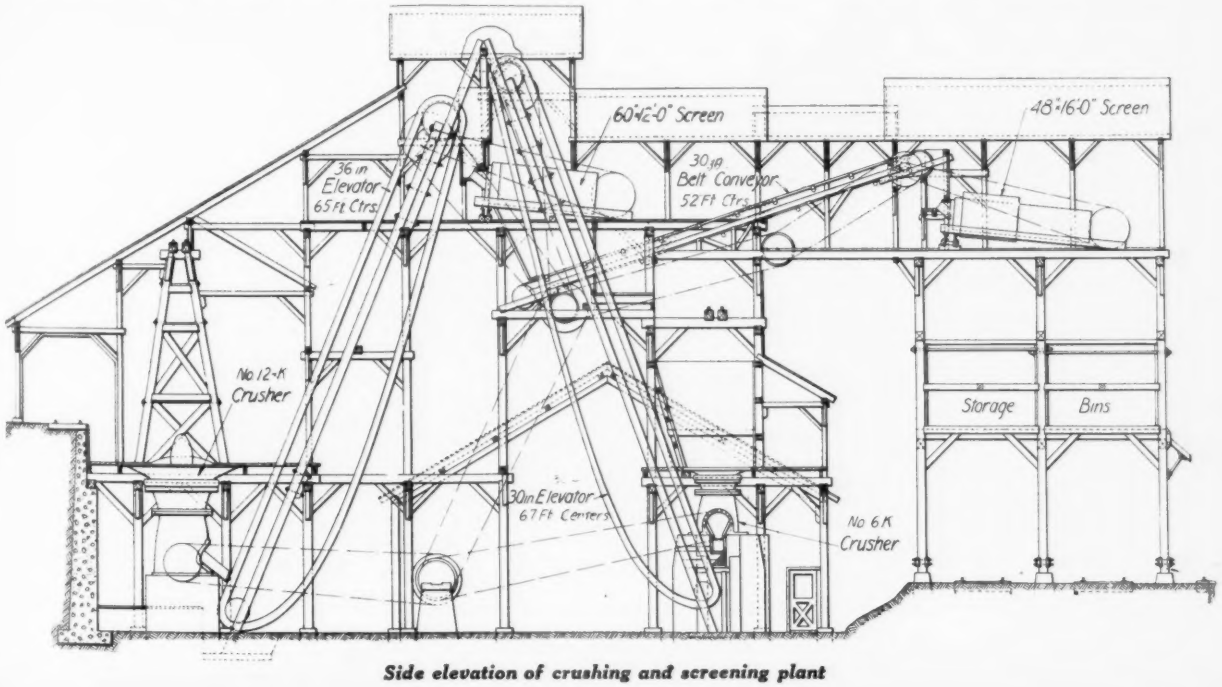
Railway sidings for loaded and empty cars are very well layed out and there is space for 50 cars on either side of the plant. Three loading tracks run under the bins so that there is no side loading. Below the plant the two outer tracks join the inside one, which passes over a 150-ton capacity set of scales. A siding extends from the loading tracks to a point on the opposite side of the plant which runs alongside and above the coal bins. Here the coal is screened and the most desirable of it retained for domestic use, as described on page 33 of the March 24 issue of Rock Products.

The quarry at this operation is a very unusual one, having two faces which are opposite and are parallel to each other. Each is approximately 1300 ft. long and averages easily 150 ft. in height, for the highest point is 185 ft. high. These two faces are 600 ft. apart and, combined, have an exposed surface of more than 375,000 sq. ft. By way of comparison, a quarry having a 1000-ft. face, 50 ft. high, is considered a nice sized deposit of limestone by the average operator, but such a face only represents an exposure of 50,000 sq. ft., which is approximately one-eighth of that exposed at the Pembroke plant.

Each side of the quarry contains an amount of stone too large to properly estimate. By driving back either side for a distance of a mile, the face would be over 600 ft. in height. In addition to the supply behind each face, each side can be lengthened as the face is driven back, so that in the course of a few decades it is possible that the two deposits will have a face of double the present superficial area.

Drilling is done with well drills and whenever possible the bench-drilling method is employed, using tripod and jack-hammer drills. A recent shot made, in which 80,000 lb. of 50 and 60 per cent dynamite was loaded in 60 holes, ranging from 125 to 185 ft. in depth, brought down 330,000 tons of stone. The holes extended over a distance of 1000 ft. and the stone brought down was sufficient for several months' operations and required four cuts with a railway-type shovel to clean it up.

All loading in the quarry is done by steam shovels. At present a Model 61 and



Side elevation of crushing and screening plant

a model 70 Marion—one at each side—are in service. One of these machines is fitted with a specially designed Missabe bucket, one feature of which was described in "Hints and Helps" in ROCK PRODUCTS March 24, 1923.

Two-way, standard-gage, 4-yd. dump cars (32 in all) are used for moving the stone to the plant, which is approximately one-half mile from the quarry. The cars are of the Kilbourn & Jacobs Co. and the Western Wheeled Scraper Co.'s manufacture. These are hauled in trains of 10 cars each by steam locomotives, which make five round trips each per hour. The company has in use two 18-ton and one 16-ton Vulcan engines and one 12-ton Porter. The latter is used in the stripping operation.

The greater part of the labor at this and other operations in the vicinity is negro. The company has its own houses in a settlement which is removed from the village of Pembroke. It is made up of boarding camps—one each for the whites and negroes—and dwelling houses for the married men. Each family is furnished with fuel at cost and a commissary is operated which enables the men to purchase living essentials at a cost considerably below the normal retail price.

Mr. Lumsden is known to many crushed-stone operators of the country, and was among those present at the last annual national convention, which was held in Chicago last January. The W. W. Boxley Co. holds six memberships in the National Crushed Stone Association, which ranks it second in number of memberships taken by any one company.

Sampling Fine Aggregate for Concrete Highway Construction

By G. W. Hutchinson

Assistant Engineer, State Highway Commission of North Carolina

THE system in use by the Division of Tests and Investigations with reference to sand sampling divided the material into three classes on an arbitrary basis:

1. Class known as commercial pit.
2. Class known as local pit.
3. Class midway between the two.

The distinction between the first two is with reference to inspection. Any pit producing sufficient material for state highway use to justify the expense will be provided with an inspector. This inspector takes daily samples of the material at the pit, and sends them direct to the laboratory, and at the same time makes all the necessary inspection of the plant operation and material, as well as any of the minor tests deemed advisable. When a shipment is made for state highway work it has a seal on the car, and the resident engineer is satisfactory. By means of the seal and the card system, the resident engineer knows that if he receives the card or finds the seal on the car the material is acceptable for use. Material received under this system which would not pass visual inspection or vary from the run of previous shipments is reported to the main office of the Division of Tests and Investigations, and the material is withheld from use waiting investigation of both the material and the plant inspector who accepted it. This system allows the contractor to use the material direct from the cars if desired and eliminates any delays or expense of demurrage on account of testing as long as uniform material is produced.

The second class is known as local pit or one where no inspection is maintained, and comes under the "Local Sand Requirements" in the specifications as follows:

Preliminary tests of local sand shall be considered as an indication of their quality. These tests will be made upon the request of any parties entitled to this consideration and need not be officially taken by representatives of the State Highway Commission unless requested.

In case the preliminary test indicates that the sand is of the quality required for fine aggregate in concrete mixtures, it will be necessary to stock pile the material in not less than 200 cu. yd. units in order that an official sample may be taken that will fully represent the material proposed for use. When a smaller quantity is required to complete the work in which it is desired to use the materials, or if impracticable on account of local conditions to stock pile this quantity, the maximum amount possible to stock pile will be accepted and taken as a unit.

The material in the stock pile will be sampled officially by representatives of the State Highway Commission and forwarded to the laboratory for test purposes. If the test results of the official samples from the stock pile indicate that the sand does not meet the requirements, an adjustment of the cement content in the mixture may be allowed within reasonable limits, by the addition of the proper amount of cement as directed by the testing laboratory based upon the test results of the official sample. Check tests will be made when requested by the contractor in writing, but the use of the material will be governed by the original test until subsequent test results are available.

The contractor will be required at all times to keep sufficient sand stock-piled in advance to allow test results of the local sands to be secured, unless permission in writing is secured from the engineer to the contrary.

It can be seen that if the contractor stock piles material sufficiently in advance, and the engineer forwards the samples with reasonable promptness, there will be no delay in the use of the material, and decisions are available to allow the intelligent use of the material in case it does not meet the standard requirements. The stock pile clause is extremely important when applied to creek sands on account of the tendency to run non-uniformly. The system necessitates rehandling the sand, but this item should be included in the contractors' proposal at the time it is submitted.

An exception to the stock pile clause can be allowed under certain conditions which will be of benefit to both the state and the contractor. This is with reference to bank sands which can be sampled in the bank by means of test holes. For this purpose the pit should be staked out over a given area, and test holes dug on not more than 25 ft. centers over this area, and to the depth desired to excavate the material.

The test holes should be approximately 2 or 3 ft. square, to allow representative sampling and proper inspection of the material in the bank. For sampling, a sharp instrument should be scraped with uniform pressure from the bottom to the top of the face of the cliff, on at least four sides of the hole. The operation should be repeated until about 50 lb. from each hole has been secured for a sample. The overburden or stripping should not be included in the sample, as this will be required to be removed from the pit before the pit is accepted. This applies to all pits, regardless of any requirements for washing.

At the time the pit is sampled, a sketch of its location, as well as the location, depth, etc., of the test holes should be made and forwarded with the sample. Remarks regarding the variation of the material in different strata from top to bottom should be included for additional information.

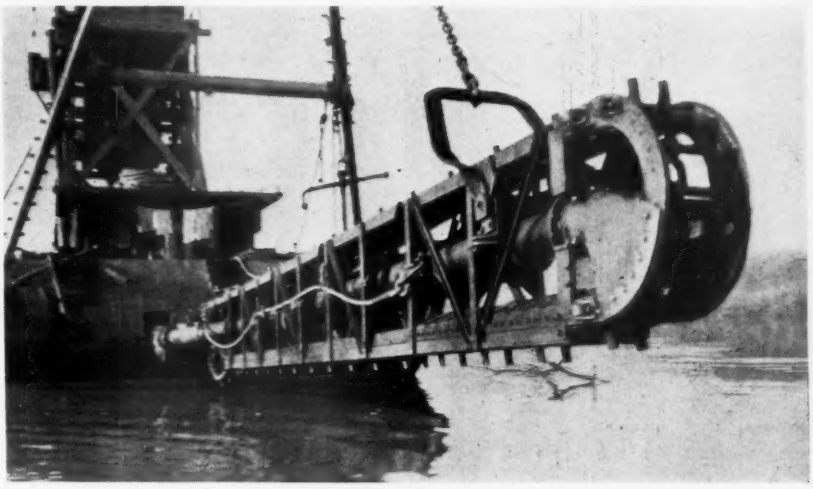
Test specimens of concrete are made in the laboratory, using the samples submitted as fine aggregate, in the proportions called for by the specifications, and as soon as the test results are available the sand in the entire bank or in certain parts is accepted, adjusted for cement or rejected, upon the basis of the value of the material when made into concrete.

The third class is practically the same as the first, except that the engineer on the work samples the material immediately upon receipt of the shipment, although the work is not held up waiting test results of the sample. In this class are placed all pits (bank sand only) which appear to have a uniform material after stripping has been removed, but do not show sufficient shipment of material to warrant the expense of an inspector. The samples submitted by the resident engineer are made into composite samples and tested twice weekly.—*Abstracted from Roads and Streets.*

The Libertyville Dredge

Interstate Sand and Gravel Company Has a Dredge Designed for Working in a Heavy Gravel Deposit with Special Arrangements for Attacking the Ground and Keeping Out Large Stones

EVERY dredge operator knows the importance of attacking the ground and keeping coarse material from entering the suction. In the last issue the application of a rotary cutter for this purpose was described. The dredge herewith described illustrates another method. A third method will be shown in an article to be published soon.—Editor.



Bow of dredge showing the traveling screen nozzle which serves as a cutter and to remove large stones

THE dredge of the Interstate Sand and Gravel Co. embodies the experience of the many years which its designer, W. H. K. Bennett, has spent in the study and operation of such machines. There is no striking novelty in the design, as there could not well be if one were to follow estabished practice on such a well known and well worked out arrangement as a dredge design. The points that are to be commended are in the way the details have been worked out and the whole built into a compact and simple unit.

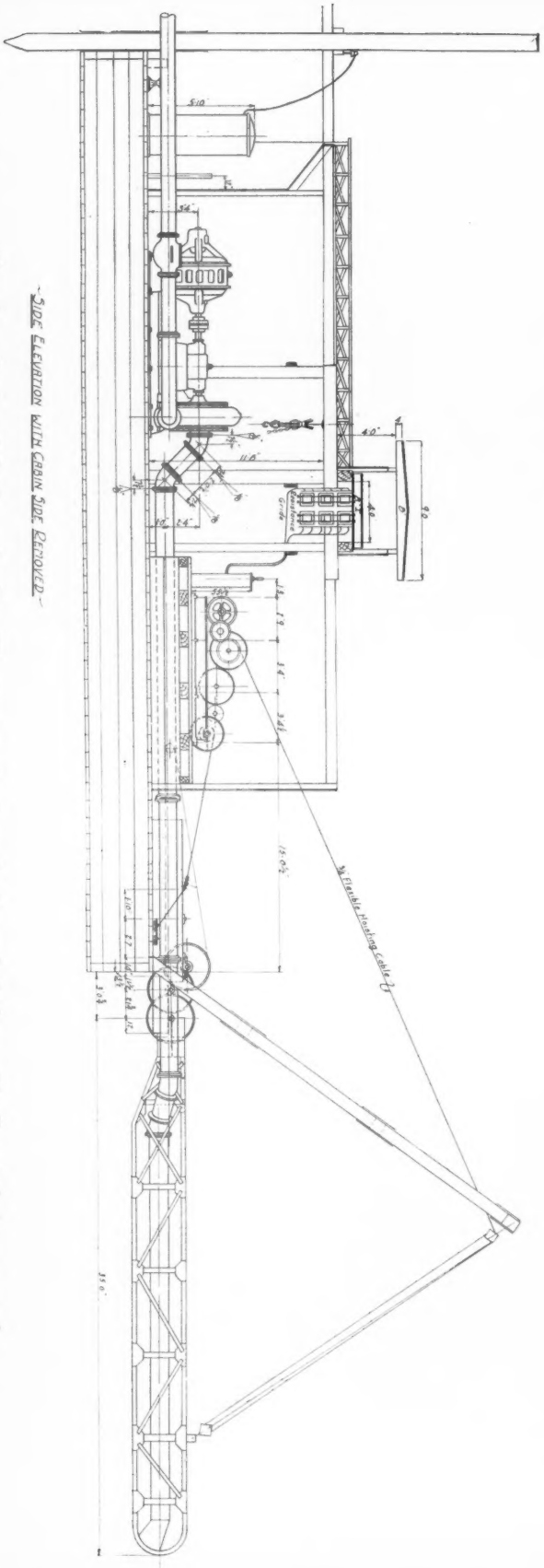
The dredge was designed and built solely to fit the conditions of the deposit in which it was to work. It is for this reason that the Swintek traveling screen nozzle was adopted in place of a rotary cutter or a cutting jet at the suction. Mr. Bennett has built and does build dredges with all three of these methods of cutting the packed sand and gravel and protecting the suction from the intrusion of large stones. But in this case he preferred the Swintek device. In his own words:

"The local conditions of this deposit demanded a mechanical agitator. My experience with the rotary cutter in such a coarse gravel deposit as this has not been satisfactory, not because it does not cut the gravel efficiently but because it does not get the coarse oversize out of the way of the suction. This coarse oversize falls back in the way of the cutter and thus diminishes the efficiency of the pump by partially obstructing the suction.

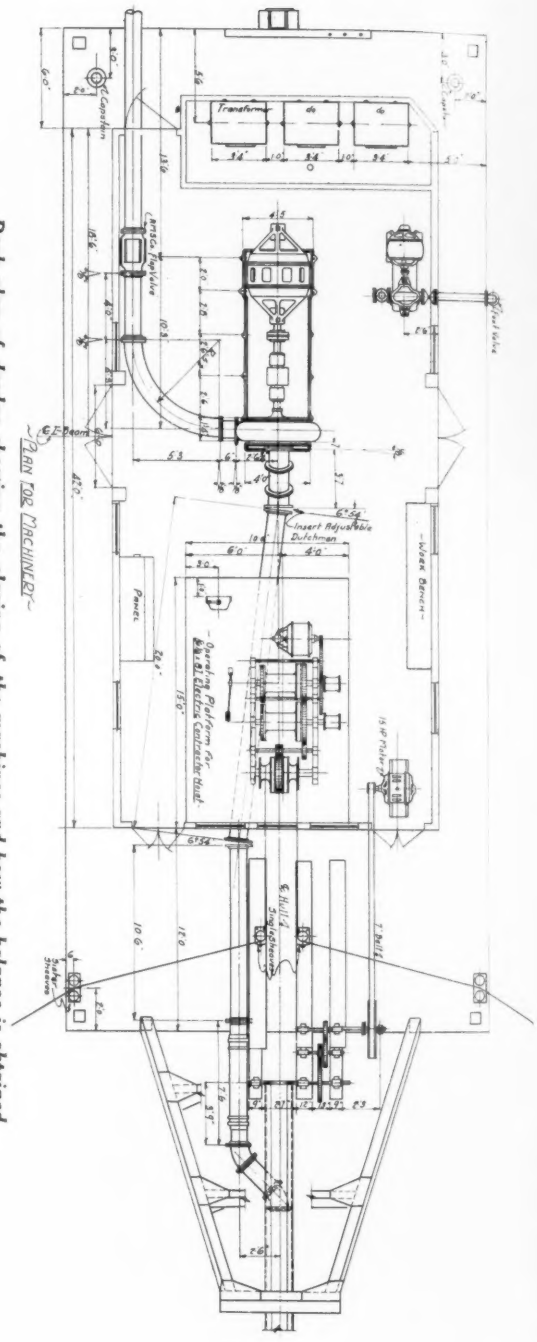
"It is for this reason that the chain cutter was installed which not only digs into the deposit and keeps the suction well supplied with solids, but carries the oversize out of the way where it cannot interfere with the suction intake as the work proceeds. The use of this cutter also eliminates, depending upon the operator to know whether the dredge suction is low enough to obtain the maximum capacity of the pump. It also permits cleaning up the bottom more thoroughly than could be done by a plain suction when working in heavy gravel. A suction without a cutter under such conditions is apt to leave the bottom in cones, or ridges, due to the constant raising and lowering of the suction.

"The horsepower requirement of the cut-

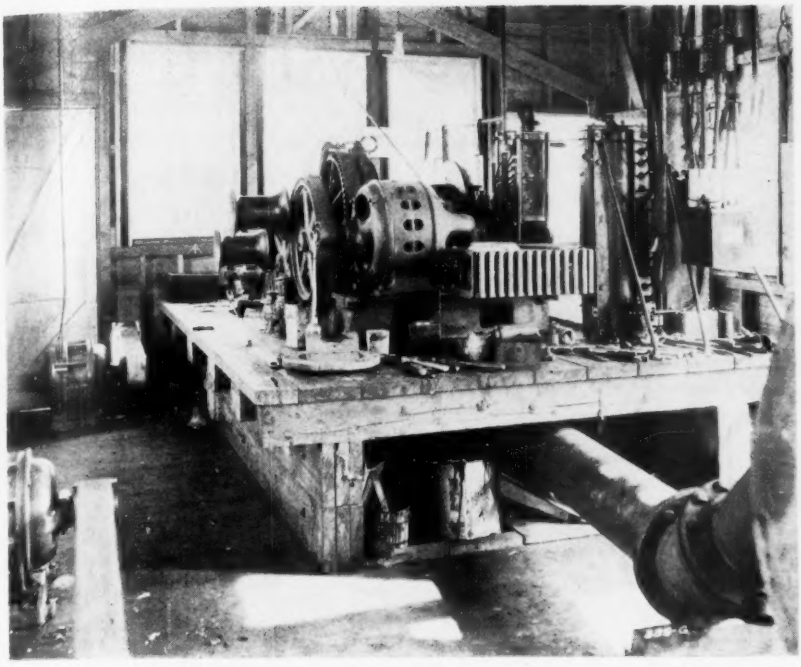
The outside appearance of the dredge is remarkably neat. Note the solid construction of the A-frame by which the suction and screen nozzle are raised and lowered



Elevation—Section of dredge and cabin. The operator stands on the forward platform with all controls in easy reach



Deck plan of dredge showing the placing of the machines and how the balance is obtained



The hoist is on a platform over the suction pipe. Priming pump and motor are at the left in the rear

ter on this dredge is low when one considers the work that it does. A 15-hp. motor and a 6-in. belt are all that are needed to drive the cutter."

The deposit lies 35 miles north of Chicago and is evidently of gravel of glacial origin which has been carried by water flows into a shallow basin. The original operation was by dragline and the stripping was thrown back into the lake. Many thousand yards were taken out by this system. When the hydraulic system was installed the old strippings, which contained a great deal of good sand and gravel, had to be worked along with the rest. But with the dredge no trouble whatsoever has resulted from pumping in this worked-over ground. The abundant water and the cutter action have been able to disintegrate it so thoroughly that a clean washed product resulted. Old sods, branches and the like were all pulled out of the way by the cutter and deposited where they did not have to be handled again.

Digging is carried to 30 and sometimes 35 ft. below water level. No particular variation in the character of the deposit is noted at different levels. It runs pretty uniformly 60 per cent gravel and 40 per cent sand. There is about 6 per cent of oversize, cobbles greater than 6 in. in diameter.

The dredge hull is of wood well braced. It is only 42 ft. long and 26 ft. wide, but the arrangement of the machinery is such that there is ample room for everything and plenty of space to pass between and around the different machines.

The design is of the "center line" type. The 12-in. Amsco pump is direct-connected to a 350 8-hp. motor and both are placed on the longitudinal center line of the dredge, and abaft the transverse center. This balances the two drum Clyde hoist which is placed forward. The dredge has its own transformer and this is placed aft on the port side. This balances the discharge pipe line which is carried on the starboard side. A glance at the plain shows how well the balance has been worked out so as to allow plenty of room for moving about on a comparatively small hull.

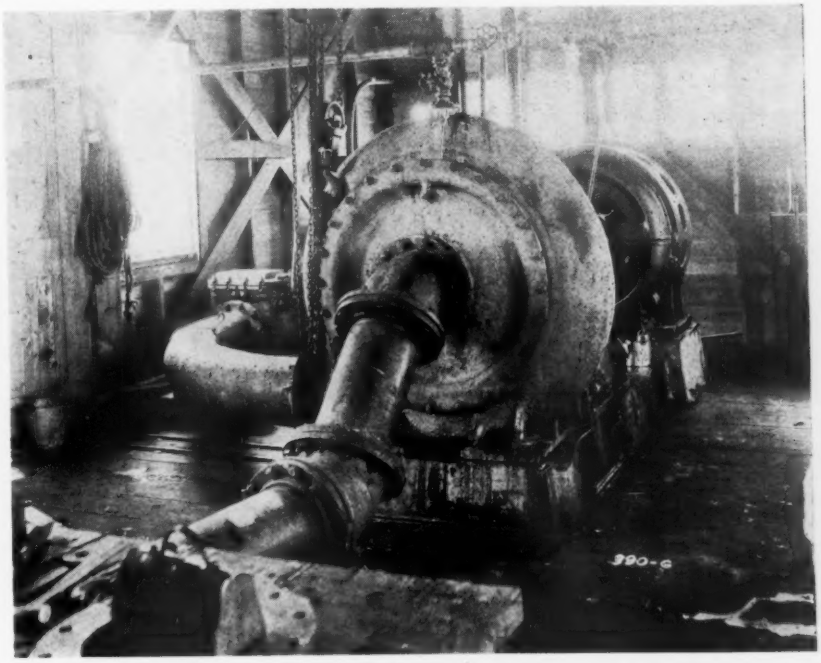
There are two spuds aft by which the dredge is "walked" and also held firmly in place, as is necessary when any form of mechanical cutter is used with a dredge. These spuds are handled by lines from the hoist. Other lines handle the Swintek nozzle. A strongly built A frame which projects over the bow gives the necessary "purchase" for this hoisting. A 15-hp. motor on the port side drives the cutter, a 6-in. belt (not 7-in., as is shown in the plan) carrying the power to the shaft which is placed at the bow. The reduction gear for the cutter is carried on a framework projecting beyond the bow.

The pictures show these details plainly and they also show the neat and workmanlike appearance of the dredge.

The dredge is now in its second year of service and nothing has developed that would show that any improvement might have been made in the design. It is thoroughly adapted to the deposit for which it was built.

International Cement Earnings

THE International Cement Corp. for the three months ended September 30, 1923, reports gross sales of $3,276,766 against $3,083,406 in the same period last year. After allowing for all expenses and reserves for depreciation there was reported net income of $755,623, which, after allowing for preferred dividends, was equal to about $2 a share on the 364,167 shares of common capital stock of no par value outstanding. In the June quarter the company reported net income equal to $1.61 a share on the common stock and $1.25 a share in the September quarter last year.—*New York Times.*



Suction side of the 12-in. pump with the 350-hp. motor behind

European Lime Kilns With Fuel Ratios of 16 to 20 Per Cent

Modern Internally-Fired Kilns Designed to Produce Varying Tonnages with Fuel Economy

WHILE internally-fired, continuous-draw shaft lime kilns seem to have been largely replaced in this country by externally-fired kilns—kilns with outside furnaces—they are still popular abroad and have been steadily improved in design. Outside of the sugar and alkali industries they do not seem to be popular in this country, although this type of kiln has several distinct advantages. The internally-fired kilns with which the American lime industry is most familiar are the old-fashioned intermittant "pot kilns."

The F. L. Smidth Co. of Copenhagen, London, Paris and New York, who are chiefy known in this country for their work in the design and construction of wet-process portland-cement plants, are equally well-known in Great Britain and Europe as builders and designers of lime plants. The following information and the illustrations in regard to European lime-kiln practice was obtained from the London office of this concern.

Governing Factors in Design

It is essential for any concern, contemplating the erection of lime kilns, to take the greatest care in the selection of a type of kiln which will exactly suit their requirements. (1) A good kiln must suit the particular limestone to be burnt. (2) It must turn out uniform and thoroughly burnt lime. (3) Its fuel consumption must be low. (4) It must be able to work with an output varying in accordance with the demand. (5) It must be simple of operation. (6) Its first cost must be reasonable with due regard to low cost of upkeep. The propensities of the limestone to be burned and the special purpose for which the lime is intended will have a decided influence on the choice of the type of kiln.

For burning ordinary lime for building purposes, etc., where a slight pollution with ashes from the fuel is permissible, a standard type of shaft kilns has been developed. Under normal working conditions these kilns will, according to their size, yield outputs from 9 to 30 tons of burnt lime per 24 hr. Fig. 1 shows the main features of the design of this type of kiln.

The kiln is lined with firebricks, and the quality of these varies in the different zones of the kiln, according to the temperature and the mechanical action in each zone. The kiln is enclosed by an outer wall or by a shell. The shell is made in reinforced concrete or iron plate. The outer wall is made of brickwork or natural stone, locally available. The shells are to be preferred, as they can be made air-tight and do not crack, thereby admitting air to the kiln, which

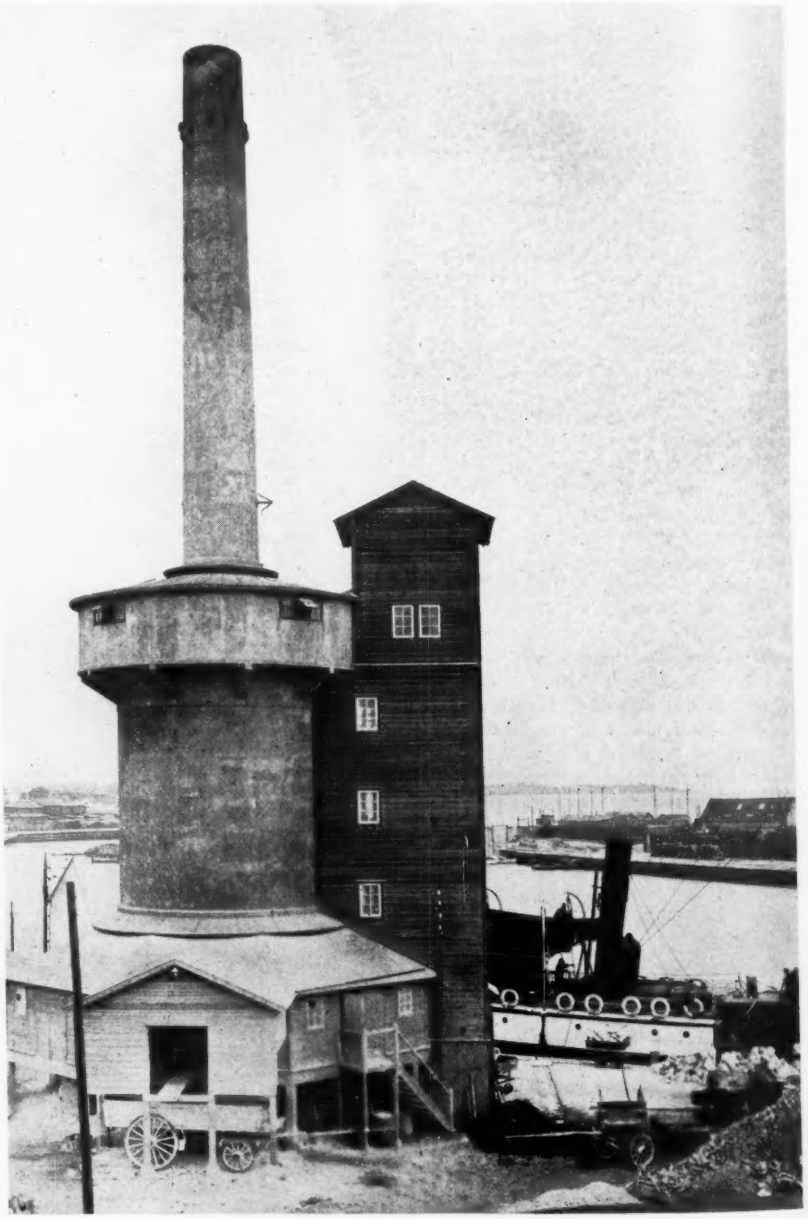
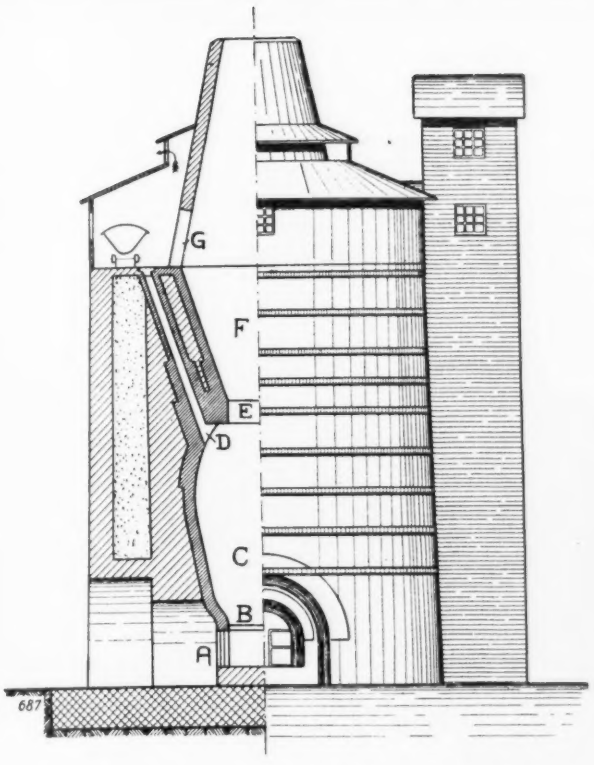


Fig. 2—An internally-fired lime kiln of a common European type which is fed by an elevator



Left—Fig. 1, showing section through internally-fired kiln. Right—Fig. 3, showing this type of kiln fed by a crane

brick or stone walls have a tendency to do, even when thoroughly strengthened by flat iron girdles.

Points in Design for Fuel Economy

Due regard has been taken in the design of this kiln to embody all features which will ensure the best fuel economy: (1) The kiln is designed for adjustment of fuel consumption so as to ensure good and even burning. (2) The kiln is designed to concentrate heat in the burning zone and to preheat the limestone and cool the lime. (3) The kiln is stoutly built and effectively insulated, thus ensuring low cost of upkeep and minimum loss in radiation. (4) The kiln is designed to maintain constant temperature in each different zone, ensuring long life of lining and no loss of heat due to reheating of brickwork.

Normally it should be possible to maintain a consumption not exceeding 18 to 20 per cent of coal, calculated on the output of burnt lime. In certain cases the coal consumption has been reduced to 10 per cent. (From 1 to 5 to 1 to 6 coal lime ratio.)

Immediately inside the shell is arranged an effective insulation of first class insulating material. The space between this insulation and the firebrick lining is filled out by ordinary brickwork. The kiln is therefore of a particularly solid and stout construction, in which loss of heat by radiation is reduced to a minimum.

The kiln, when working, is full of material from the grate *B* to the ports *G*. (Fig. 1.) All fuel and limestone is fed into the kiln from the top platform. It is therefore necessary to convey the materials to this level either by means of an elevator or in cars across a bridge leading direct to the platform or carried to the platform by means of a car lift.

The raw limestone, together with part of the fuel, is filled into the kiln through the ports *G*. At regular intervals burnt lime is drawn out through the bottom grate. Thereby the materials are sinking through the kiln from the preheating chamber *F* to the burning zone at *D* and from the burning zone down through the cooling chamber *C*.

The air for combustion is drawn in through the grate *B*. Rising through the hot lime it gets heated and arrives at the burning zone preheated to burning temperature. Proceeding further through the chamber *F* the gasses transmit heat to the limestone and fuel, thereby preheating them.

As mentioned, part of the fuel is filled in together with the limestone at *G*. For this purpose a non-gaseous fuel should be preferred, for instance, coke, coke dust or anthracite. The rest of the fuel is added through the firing holes *D* and should preferably be rich in gas, as for instance, Newcastle coal. Ordinarily the larger portion of fuel is fired through the firing holes, and only a smaller part is added, mixed with the limestone, but the proportion depends on the quality of the limestone and on the sort of fuel available, and also on the running of the kiln.

In order to obtain the best economy in working, the kilns are designed in such a way that the lime leaving the kiln has been perfectly cooled, and that the flue gasses leave the kiln with a temperature just sufficient to effect the necessary draught.

As the firing can easily be inspected through the firing holes, the burning temperature can be regulated within narrow limits, and maintained uniformly all over the burning zone. Consequently a uniform and thoroughly burned product is obtained with the least possible amount of fuel.

The carbon dioxide generated during the calcining of the limestone escapes immediately, which is an essential point as regards economy.

Flexibility of Output

Another advantage of this design of kiln is claimed to be that the daily output of the kiln can be adjusted within wide limits to suit the daily demand. As an example can be stated that with a continuous shaft kiln, built for a normal output of 15 tons of burnt lime per 24 hr., the output can be forced to about 20 tons, or 33 per cent above the normal. Further, by regulating the supply of air and fuel it is possible to reduce the capacity of the kiln to about 3 to 4 tons of burnt lime per 24 hr., or 20 to 25 per cent of the normal capacity, without unduly raising the coal consumption per ton of burnt lime.

The attendance of the kiln is very simple, as all piling of stones in the kiln is avoided. The limestone is simply thrown into the preheater. Further, the working of the kiln can be reduced during the night time and on Sundays and holidays, so that only a few men are required for the attendance.

The standard type described above is comparatively cheap to build and can be used in most cases when the question is of burning lime for building purposes, etc. The extensive use of this kiln is proof of the successful design.

Gas Fired Lime Shaft Kilns

Kilns for half-gas firing or firing with producer gas are used where no impurities from the fuel can be tolerated in the burnt lime, or when the fuels available are better suited for use in a furnace or in a gas producer than for being mixed with the lime—for instance, on account of too high a content of ashes or moisture.

If half-gas firing is adopted, fire boxes with step grate furnace, mechanically driven grates or crude oil firing devices are built into the outer wall of the kiln, and the gas from these half-gas furnaces is led into the kiln at suitable points in the firing zone. For ordinary gas firing producer gas is used, generated in special gas producers from which it is conveyed to the kiln through piping.

Opportunities for Manufacture of Lime in China

One of the Oldest Industries but Not Yet a Modern Lime Plant

By M. H. Chou, M.S.
Shanghai, China

IT IS a very hard matter to trace the time when the lime was first made in China, or first used for building purposes, or as fertilizer. It is understood that the Chinese have used it at least several thousand years.

Occurrence

Limestone occurs very abundantly in China. We can find it in every province. Moreover, there is quite a bit of dolomitic limestone, as reported in the record of the Geological Survey.

Manufacture

The process of manufacture of lime from limestone, as practiced in China, is entirely in the hands of farmers or those laborers who are employed by some companies for manufacturing lime.

First, limestone in the quarry is broken by hand or by gunpowder. Big lumps of limestone are piled up to form a kiln where wood and straw are burned until most of carbon dioxide is driven off.

Another method of manufacture, as shown in the view herewith, is very interesting. First of all coal dust is wet and pressed into cakes together with mud. Then the coal cakes and limestone lumps are piled together one upon another. The whole pile is surrounded by some fire-resisting clay-stone. Fire is started from a small opening at the top of the pile. The pile burns for a week. After that the surrounding claystone is taken away and the lime formed is sorted out from the pile. It takes an enormous amount of labor. This process is quite feasible in China because of unparalleled cheapness of labor existing in China.

The price of lime in Shanghai is two Mexican dollars (equivalent to $1.50 gold)

Locality	SiO_2	Al_2O_3	CaO	MgO	CO_2
Han-chin (Mukden)	.393	1.754	37.893	7.676	49.890
Ka Ban—					
Sample 1	4.80	2.30	18.52	24.51	42.95
Sample 2	1.60	.47	36.94	9.27	47.76
Sample 3	10.44	.99	28.49	15.68	41.58
Sample 4	6.893	1.185	29.993	28.208	40.609
Sample 5	9.74	1.50	26.57	17.25	43.62
Sample 6	9.39	.66	32.48	8.76	45.77
Nee Hsin—					
Sample 1	.13	1.18	42.47	11.68	.....
Sample 2	.10	.25	50.24	6.10	.....
Sample 3	1.18	.32	46.83	8.34	.....
Wusih—					
Sample 1	5.39	6.13	41.25	7.78	39.24
Chao Hsin	15.18	7.13	39.85	5.14	30.80

The analyses of some nearly pure high calcium limestones are as follows:

Locality	SiO_2	Fe_2O_3 & Al_2O_3	CaO	MgO	CO_2+H_2O
Wusih—					
Sample 1	.39	.19	54.58	.71	43.74
Sample 2	Trace	.20	55.51	.53	43.61
Sample 3	.10	.17	54.66	.93	43.68
Sample 4	2.95	1.10	52.30	.51	42.43
Sample 5	4.02	2.25	50.47	.99	41.31
Sample 6	1.83	.71	52.05	1.43	42.44
Nee Hsin—					
Sample 1	.41	.10	53.18	.90	.....
Sample 2	.49	.12	52.94	2.31	.....
Tung Ting—					
Sample 1	.05	.14	55.38	.43	.....
Sample 2	.43	.15	53.51	2.11	.....
Sample 3	.29	.23	54.87	.82	.....
Sample 4	.05	.08	55.50	Trace	.....
Kan Tze—					
Sample 1	.05	.11	55.04	.13	43.70
Sample 2	.42	.32	54.18	.22	43.38
Sample 3	.15	.20	54.96	.18	43.75
Ching Kiang—					
Sample 1	1.83	1.10	53.50	1.74	42.76
Sample 2	1.10	.27	54.75	.64	43.21
Sample 3	1.79	.49	53.87	.53	43.02
Lungtah—					
Sample 1	.36	.30	55.44	.43	43.75
Sample 2	.09	.11	55.43	.16	.....
Tong Shan	2.22	.42	52.46	.30	42.80
Wuchow	.06	.09	55.94	.18	43.75
Unknown—					
Sample 1	.22	.18	55.91	.32	.....
Sample 2	3.38	1.50	53.61	.62	.....
Sample 3	3.57	.39	51.09	2.98	.....
Sample 4	.99	.27	54.63	1.19	.....

Analyses of various Chinese limestones

Although China uses immense quantities of lime, it is all produced in these old-fashioned kilns. There is not a modern kiln in the country

per 250 lbs. It is extensively used for building purposes. The farmer uses it as a fertilizer. The paper manufacturer uses it to disintegrate the bamboo. It is used as flux for making pig iron in many iron works in China. The wine maker cures the sourness of wine by adding lime to it and filtering. The pharmacist uses it for dehydrating purposes. The cement maker uses it for making cement.

However, the use of lime can be greatly extended as fertilizer by the farmer, if there is a new modern grinding mill to reduce lime into powder. As there is practically no work done either by the government or by private interests to test the acidity of the farm soil, it is very hard to convince the farmer to increase the amount of his crops by means of lime.

Future Outlook

The lime industry in China has not yet been modernized. But it will be eventually done in the near future, for there is a great demand for the lime of better quality. It will present a great opportunity to American manufacturers of lime kilns to introduce their equipment into the field of manufacturing activity in China. So far as I know, there is no single concern which is employing a modern lime kiln for the manufacture of lime.

Plaster of Paris*

IV—Setting and Testing of Finished Plaster

By A. Brittain, M.Sc., A.I.C., and C. Elliott, B.Sc.

ALMOST important matter to be considered in the setting of plaster is the amount of water using in gaging. Kerr and Montgomery (Tran. Amer. Ceram. Soc., 1916, 18, 180-191) state that an increase in the amount of water added to plaster increases the time of setting and reduces the tensile strength of the set material.

Winterbottom, however, while admitting that the tensile strength decreases with increase in the amount of water, states that "the quantity of water used in gaging does not seem to make much difference to the rate of setting of plaster, although for purposes of standardization it is always advisable to work all tests under as nearly the same conditions as possible." We do not agree with Winterbottom, since experiments that we have made show that, in accordance with the observations of Kerr and Montgomery, the amount of water used in gaging has a considerable influence on the setting time as well as on the tensile strength. Some of our results are set out in Table VII.

TABLE VII.

Plaster	Per cent H_2O in mixture	Setting time Vicat needle. Initial set	Setting time Vicat needle. Thermo. Final set	Tensile strength. Lb. per sq. in.
Table III., No. 1..	30	4	21	457
	35	11	34	357
	40	....	....	262
	45	15	35	183
Table III., No. 2..	30	7	25	397
	35	11	31	271
	40	15	35	238
	44	20	40	150

The temperature of the water used in gaging plaster should be as uniform as possible. Although we have no actual data, it seems to be clear that a high temperature of the water will accelerate the setting. On the other hand, Kerr and Montgomery (*loc. cit.*) have observed that the tensile strength of plaster mixed above 24 deg. C. decreases in proportion to the increase in temperature above this figure.

Throughout the work recorded in this paper, the initial setting time has been determined by use of the Vicat needle, and has been taken as that point at which the needle will no longer penetrate the material, the time being taken from the moment the plaster and water are mixed. The final setting time cannot be determined by the Vicat needle, but was fixed by the thermometer method, the time taken for the mass to reach its maximum temperature being regarded as its final setting point. By this method the initial set cannot be determined with any degree of accuracy, but usually corresponds to a point represented by a rise of 3 to 4 dg. C.

The tensile strength test was taken after seven days, when the briquets were completely dried out, the results given being the average of several tests.

Summary

In summarizing this part of the paper, the following conclusions can be drawn:

(1) In general the properties of a plaster depend on the method of manufacture, the temperature and the time of calcination.

(2) The setting time and tensile strength of a plaster are influenced by the state of subdivision. The setting time is accelerated and the tensile strength increased by an increase in the fineness of the particles. Regrinding after calcination gives a stronger material and an accelerated set.

(3) Gypsum acts as an accelerating agent, but decreases the tensile strength. Any excess over the 2 to 3 per cent usually present must be regarded as an impurity, which reduces the quality of the plaster.

(4) Slow-setting anhydrite retards the setting of plaster and causes the increased setting time shown by plaster manufactured at moderately high temperatures.

(5) Dead-burnt plaster and natural anhydrite act as inert impurities. They reduce the tensile strength but have little effect on the setting time.

(6) The setting time increases and the

tensile strength decreases with increase in the amount of water used in gaging.

(7) Variations in the temperature of the water used in gaging cause variations in the setting time and tensile strength.

Testing of Plaster

The commercial value of a plaster depends on its capacity to set with water to a hard, coherent mass. The setting is due to the solution of the hemihydrate and its subsequent deposition as crystalline dihydrate. The hemihydrate is continuously dissolved and deposited as dihydrate, the latter forming bundles of interlocking crystals which, when the hydration is complete, form a hard, resistant mass.

As we have observed, the setting of a plaster is influenced by the amount and temperature of the water used in gaging by the size of the particles, by its chemical composition and treatment subsequent to calcination. Finally, but by no means least, the result of the test will depend to a considerable extent on the method employed.

In this country there is no recognized standard by which plasters can be tested and compared. Each manufacturer does his own test in his own way, and has his own idea as to what the initial and final set of plaster means. We have compared the methods used by different makers to determine the setting time of plaster, and have found very wide differences in the results obtained.

Since the setting of plaster is due to a simple crystallization it is obvious that the "true" or "final" setting point is reached when the crystallization is complete. The determination of this point can be made more or less accurately by methods known to science. Since, however, plaster becomes unworkable long before the final setting point is reached, another and much less defined point in the crystallization is accepted and known as the "initial" setting point. This point has been defined in various terms by different manufacturers, but there seems to be no unanimity. This point is, perhaps, more important to the user than the actual final setting point, since, as we have previously remarked, plaster becomes unworkable before the final set is reached.

The initial setting point might be regarded as that point at which a plaster when made into a thin cream with water becomes of a workable consistency. Another definition is that the initial set is reached when plaster, made into a thin cream, just becomes unworkable. These two definitions are vague and in no way define the conditions under which the test should be made.

As we have shown, the setting points are influenced almost as much by the conditions under which the set is taken as by the actual properties of the plaster itself.

Since the percentage of water used in gaging influences the setting time, it becomes necessary to define the amount of water to be used. Here we are confronted with certain difficulties. Plasters vary in state of subdivision, and a coarse plaster will require less water to gage than a fine one, while the denser plasters will require different amounts of water from the more bulky ones. Again, all plasters are not calcined to the same degree and contain in themselves appreciably different percentages of water. For standardization purposes, these difficulties could be overcome by the adoption of a "standard consistency," that is, by regulating the amount of water used for different plasters so as to obtain a gaging of recognized fluidity or viscosity.

To obtain this standard consistency some kind of instrument would have to be employed, and it has been claimed in America that the Southard viscosimeter has been used with satisfactory results. This apparatus consists of a vertical brass cylinder of 2 in. bore, with a graduated horizontal circular disc flange flush with its upper end. A piston attached to a screw moves in the cylinder at a speed which can be regulated at will. The gaged plaster is poured into the cylinder until flush with the disc. The piston is raised by 10 turns of the screw, at the rate of one turn per second. The upward motion of the piston causes the mixture to overflow as a circular pat. A mixture of standard consistency is such that it gives a circular pat which averages 9.7 cm. in diameter, and this consistency is reckoned as the number of cubic centimeters of water required to be added to 100 g. of plaster.

In the standardization of portland cement the Vicat needle is the recognized instrument for determining the setting times. In the case of plaster the initial set can be determined by means of this instrument and with very consistent results, but the final set cannot be so obtained. In our experience the only way in which the final set can be determined readily is by the thermometer method. Plaster, when setting, evolves a considerable amount of heat—heat of crystallization. So long as the crystallization, and therefore the setting, proceeds heat will be evolved, and the temperature will rise. Consequently the final set will be that point at which the temperature of the mass ceases to rise. By immersing a thermometer in the setting mass the heat rise can be followed and the final set thus determined. The initial set cannot be obtained directly by this method, but, as we have already said, it usually corresponds to a rise of 3 to 4 deg. C.

There are many other points that might be considered in the question of the standardization of testing of plaster, but this is too big a subject to enter into here, and affords subject matter in itself for a series of papers. We cannot help, however, being impressed by the casual methods used in this country for the testing of plaster, and we should welcome the adoption of some standard by which plasters could be compared.

Grosvenor Chambers,
33 Blackfriars Street, Manchester.

(Concluded)

William Urschel Co. Builds New Lime Kiln at Gibsonburg, Ohio

GROUND has been broken on the Michael property, south of this city, for a new modern lime kiln. This land, which was purchased a few years ago by the American Gypsum Co., has been purchased by Wm. Urschel of Toledo, one of the country's biggest men in the lime industry. Mr. Urschel has acquired 15 acres on the west side of the railroad and 40 acres adjoining this on the west from the Zorn-Hornung Co. Beside this he holds an option on the Long farm, just south of this tract. It was rumored Wednesday that this latter farm had been purchased, but it was impossible to verify the report.

The plans for the building of the new kiln are practically completed and workmen are engaged at the preliminary work. Mr. Urschel is desirous of pushing the work as rapidly as possible and hopes to have the plant ready to make lime by the first of March. Forms are already on the grounds for the kilns and it is planned to pour concrete as soon as possible, possibly working day and night shifts. The quarry, according to present plans, will be opened some several hundred feet southwest of where the kilns will be erected.

Tentative plans of Mr. Urschel favor the closing of the road going east and west past this property and connecting the road at the railroad crossing with a new road which would be built by the company along the Pennsy tracks to this city.

Surveyors for the Pennsy company were on the grounds Wednesday making plans for the laying of a switch which will run just east of the kilns and sheds.

F. H. Weber of Woodville will be the superintendent of the new concern, which will be known as the White Star Line Products Co., with headquarters in Toledo.

Mr. Urschel recently started the erection of a new kiln at Woodville. An injunction secured by the Woodville Lime Products Co., of which Mr. Urschel is treasurer, halted the work, and he immediately threw the scene of his activities to this locality, figuring that the injunction will be in court for some time.

The new industry will start with from 10 to 17 kilns and will mean the addition of many families here. This in turn will mean the building of many new homes for the city.—*Gibsonburg (Ohio) Derrick.*

Nature, Preparation and Use of Pulverized Coal*

Part IX—Conveying and Distributing Systems for Handling Pulverized Coal and the Unit System in Which Each Furnace Is Supplied with a Self-Contained Unit

By Richard K. Meade
Chemical and Industrial Engineer, Baltimore, Md.

WITH all of the types of pulverizer which have been described, the powdered coal is conveyed from these to a large bin or numerous small ones located adjacent to the furnaces. In the cement industry the practice until very recently has been universally to convey the coal to the point of use by means of a screw conveyor (and bucket elevator, if elevation is necessary). This could be easily done here because, with the exception of a very few plants where the driers were also heated with pulverized coal, the latter had to be conveyed only to the kilns. This permitted the fuel-pulverizing building to be located adjacent to the kiln building and one straight screw conveyor carried the powdered coal to the kiln bins. In some instances the coal mill and kiln building adjoined each other. It was generally considered better practice, however, to have an alleyway between the two departments. At a few plants, screw conveyors of several hundred feet were required to carry the coal to the kiln building, but at most plants a conveyor half this length was sufficient.

With the application of powdered coal to metallurgical furnaces, however, the problem of conveying this fuel was by no means so simple. In many of these plants it was necessary to supply pulverized coal to from 50 to 100 small furnaces located over quite an area. It often happened, too, that overhead shafting, traveling cranes, etc., prevented the installation of screw conveyors about the fuel bins. To get around these difficulties, therefore, a number of methods were devised for conveying the coal from the fuel mill to the point of use.

In a few of the older installations the pulverized coal was deposited in a tightly enclosed bin mounted on a truck and this was hauled by means of a locomotive to that department of the plant in which the coal was to be used. The contents of the bin were then discharged into the boot of a bucket elevator and carried by the latter up into a bin from which it was fed to the furnaces.

This method was cumbersome, and so pulverized coal engineers began early to experiment with the conveying of coal by means of air. A number of systems were developed with this end in view. One of the best known of these is that devised by Quig

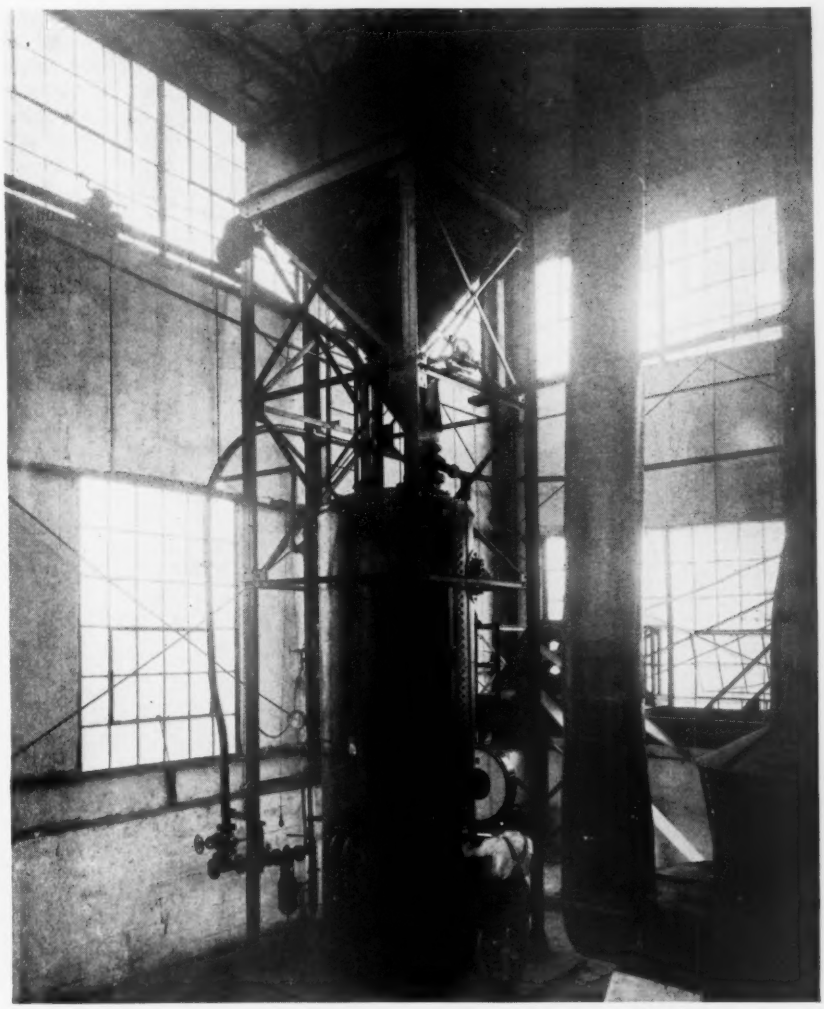


Fig. 20—Interior of pulverizing plant showing a 3-ton blow tank unit; 3-ton powdered coal bin with structural steel support; dust-tight gate, flexible connection to blow tank, quick-reading dial scale, shutoff valve and Stratton separator in compressed air line for removing moisture

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ley, which was first successfully installed in 1912. In this system (Fig. 20) the powdered coal is conveyed into a bin in the roof of the pulverizing building. A blow tank made of heavy steel plate is located below the bin into which the coal is delivered as desired. The coal is then blown from this tank by means of compressed air and forced through an ordinary pipe line to bins located at each furnace. This system is naturally an improvement over the old screw conveyor, which was not only troublesome and expensive itself, but the necessity of keeping it under cover out of doors required the building of covered bridges, etc., from one building to the next. With the air system only a small pipe is necessary to carry the coal from one building to the other. It is possible with a 4-in. pipe to convey at least 30 tons of coal an hour with an expenditure of 0.0025 lb. of air per pound of coal conveyed.

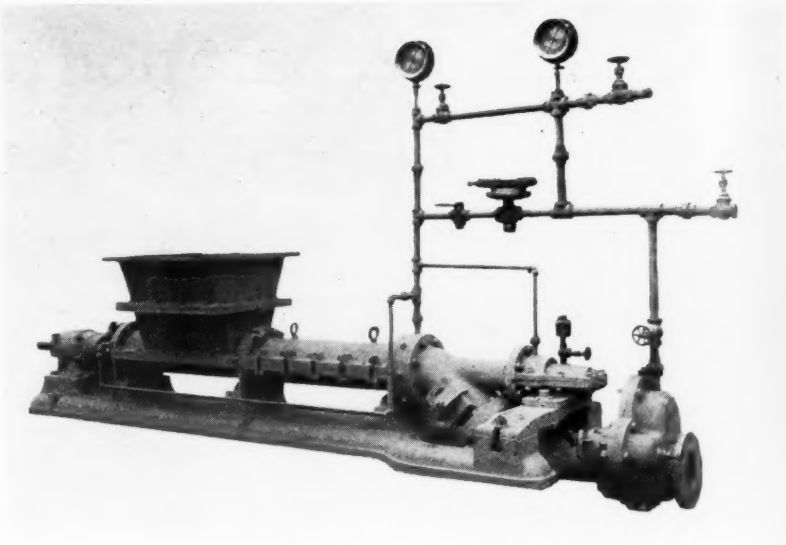

Fig. 22—Fuller-Kinyon pulverized coal pump

Fuller-Kinyon Conveying System

Another system which has been quite extensively employed is that invented by Kinyon (Fig. 21). This consists essentially of four elments:

1. A power driven pump, the function of which is to start the mass in motion.
2. A source of compressed air supply.
3. A pipe line through which the material flows.
4. Diverting valves which permit the flow of material to be discharged through any one of a number of branch lines leading into furnace service bins.

The pump (Fig. 22) embodies a specially designed worm or screw revolving in a closed chamber or working barrel. The screw is mounted on an extension shaft bearings. This arrangement prevents contact between the bearing metal and the pulverized material. The screw is usually driven by a direct-connected motor. A separate motor-driven air compressor is provided to furnish the necessary air for aerating the coal. However, where an air compressor is already installed in the plant, this unit is depended upon for the air supply.

Pulverized coal is fed by gravity from the storage bins or from the Fuller mills direct into the pump hopper by gravity and is carried by the screw to the discharge end. The design of the worm is such that the material is compressed as it moves forward so that at the end of the worm it is dense which passes through end packing boxes in the casing and is supported on outboard enough to act as a seal or check against the compressed air and prevent the latter from blowing back into the feed bin.

At the discharge end of the screw the mass is aerated by a small amount of compressed air at moderate pressure. The pressure and amount of air are regulated and depend upon the distance, height, etc., to which the material must be conveyed. This aeration changes the nature of the material from a compact mass to a semi-fluid, in which state it is carried to its destination. The amount of air used is so small that no cyclone separator or dust collector is re-

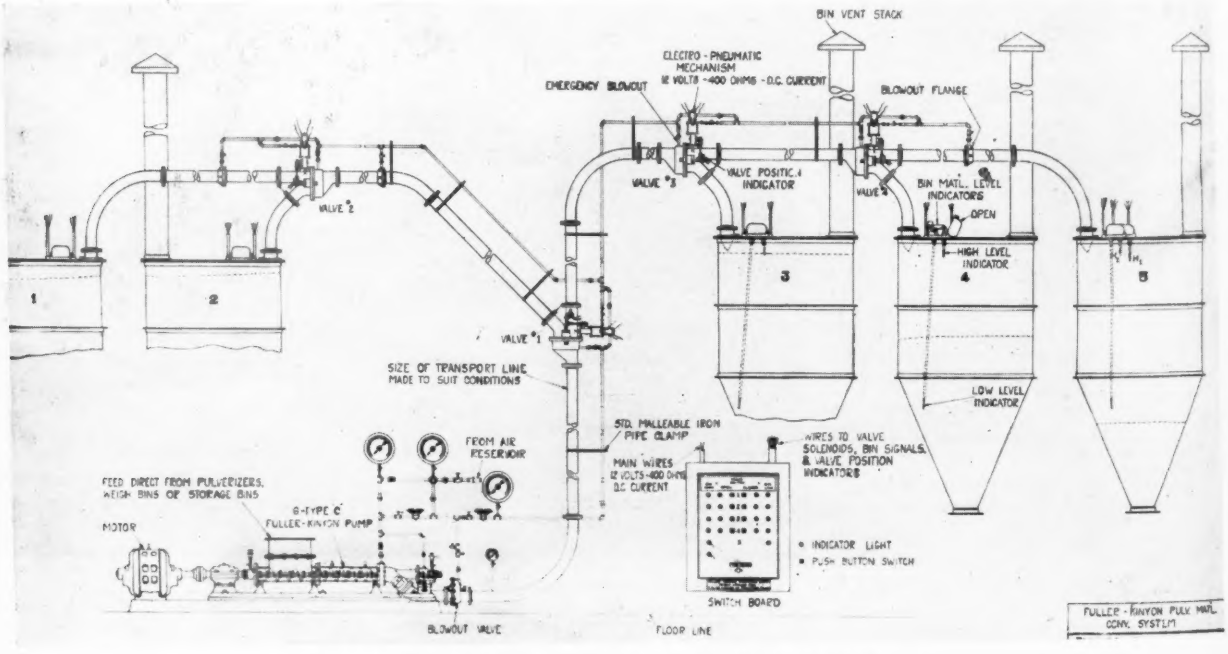

Fig. 21—Fuller-Kinyon system of transporting pulverized coal

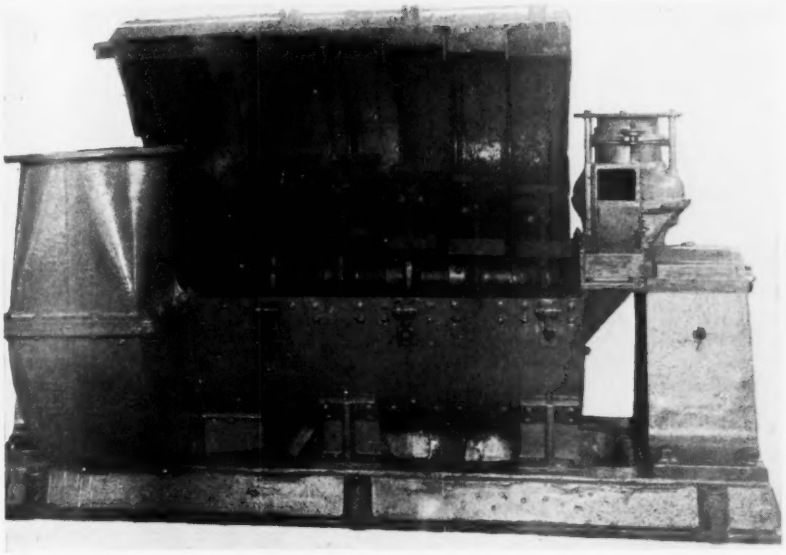

Fig. 23—Aero-pulverizer, with casing lifted to show the fan and beaters

quired at the point of delivery. An extra air line by passing the pump is supplied so that the pipe may be cleared of material whenever the pump has been stopped.

The pump, consisting of a 6-in. worm, is capable of handling upward of 20 to 50 tons of pulverized coal per hour, and easily handles material a distance of over 1500 ft. The power is approximately the same as would be required for screw conveyors and elevators doing the same work. The air pressure required various from about 15 lb. per square inch for short distances to about 45 lb. for longer distances. The air volume varies from 6 to 8 cu. in. free air per cubic foot of pulverized coal handled.

Distribution Line

The conveying line is usually built of ordinary black or galvanized iron pipe properly jointed to eliminate recesses in which particles might lodge. The diameter depends upon the quantity of coal to be transported, but ordinarily varies from 3 in. to 5 in. It may be carried in the most convenient manner such as on overhead supports, laid underground, or placed on the surface to follow the natural slope of the land. Bends, elevations and depressions do not decrease the satisfactory operation of this system, although no doubt as with liquids they increase the frictional resistance to the flow of the coal and hence increase the power or air required.

Distributing valves are placed in the main line at points where the main flow is to be diverted to one or more branch lines. In the Fuller-Lehigh system these are of the disc multiple discharge type and are electro-pneumatically controlled from a convenient point. Their action is positive, preventing the flow past the ports which are in closed circuit and at the same time allowing unobstructed passage through the open main.

The individual furnace bins are usually equipped with indicators showing the condition of the contents of the bin. In the Fuller-Lehigh system, there are high and low point indicators, which automatically and instantly reflect the condition of the bins on the switchboard located at any convenient point in the coal preparation plant. Thus the operator under this system has constant intimate knowledge of the fuel supply in all the bins throughout the plant, and by means of the electro-pneeumatic valves he can instantly direct the flow of material from the main line to any individual point without leaving the coal house.

In the Quigley system a "stock tester" gage is installed on each bin. The indicator of this is placed in a convenient reading position and is suspended from a chain and rod from a sheave. This chain has its other end attached to a heavy metal conical float. By pulling down on the rod and then allowing it to settle back until resting on the fuel level, the quantity of coal required to fill the bin is shown on the indicator board.

The advantages of the pipe-line system of transportation are apparent to any one familiar with the installation and operation of any of the older methods of transportation. Briefly they may be summed up as follows:

1. *Safety*—The amount of air used is so small (less than 1 per cent of that required for combustion) that combustion cannot be supported in the line and an explosive mixture is nowhere approached.
2. Perfect adaptability and flexibility to any existing or contemplated plant layout.
3. *Cleanliness.*—The apparatus and transportation system are completely enclosed. No pulverized material can escape in transit which would create a dusty, unhealthful or dangerous atmosphere.
4. Minimum installation and repair costs, particularly when the coal has to be conveyed long distances.

Unit Systems

We now come to the second method of preparing coal in which each furnace is supplied with its own self-contained pulverizing unit. This latter is so arranged that the fine material is sucked out of the pulverizer by means of a current of air and carried by this to the furnace. In this system the pulverizer regulates its work to meet the needs of the furnace and there is no storage of pulverized coal. The pulverizer produces fuel only so fast as the furnace uses it, but it is quite possible with these pulverizers to split the stream of coal and air and heat several furnaces with one pulverizer, etc.

These pulverizers are usually located just

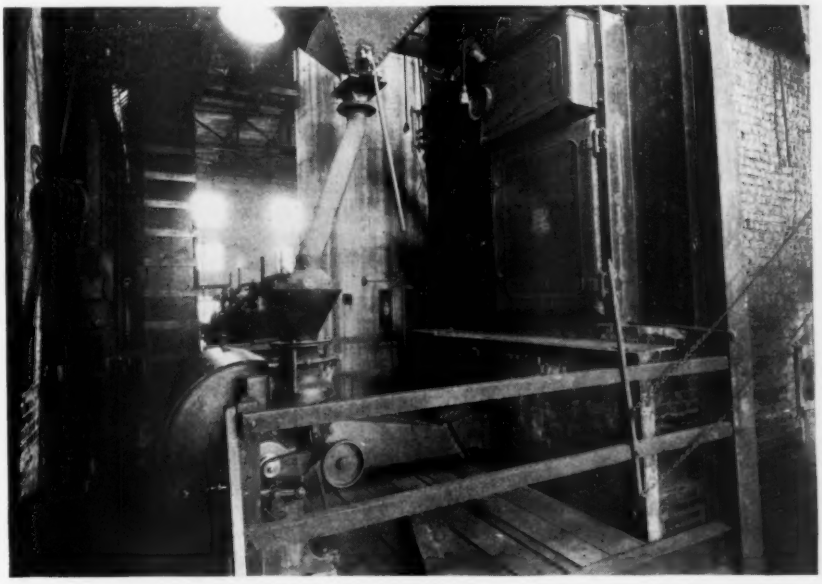

Fig. 24—Aero-pulverizer heating boiler in the Kansas City & Southern railway power plant

in front or alongside of the furnace and are fed from an overhead bin. The coal is crushed at some central point or where it is received from the cars and conveyed by belts to the bins. A magnetic separator should be provided to remove scrap iron and scales are also desirable for weighing the coal. Fig. 12 shows an arrangement of track hopper, magnetic separator, elevator, bin and aero-pulverizer suitable for rotary lime kilns.

The advantages of this system are: 1. Simplicity of outfit required. 2. Low first cost, particularly for small installations. 3. Adaptability to plants when building and floor space is limited. 4. Drying of coal not necessary.

The disadvantages are: 1. Less economical of power, labor and repair where units are very large. 2. Necessity of either shutting down the furnace to make repairs to the pulverizer or else having a spare unit. 3. Difficulty of conveying lump coal to a large number of points.

The system is unquestionably indicated for use where only a few furnaces are to be heated and where it is desired to reduce the cost of the installation to a minimum.

There was formerly much objection to these unit pulverizers on the score that they gave a product which was not of uniform fineness and which contained some coarse coal. Improvements have been made, however, in this type of pulverizer which now insure a much more uniform fineness than formerly and a better regulation of coal and air supply to the furnace.

Several mills are on the market which are designed to pulverize coal to the required degree and blow it into the furnace in one operation. With apparatus of this type no storage of the powdered coal is necessary and the coal is merely conveyed by means of a blast of air from the pulverizer into the furnace. Owing to the large quantity of air passing through the pulverizer, partial drying is effected during the process of pulverizing and in most instances no artificial drying of the coal is necessary.

With coals from the Eastern fields, which do not ordinarily contain more than 10 per cent moisture even under extreme conditions, no drying of the coal is necessary. Some of the Middle Western coals, however, are rather high in moisture and of rather low calorific value, and with these drying will often have to be resorted to as otherwise it may be difficult to keep combustion going.

Even here whether coal will have to be dried or not will be determined more by the requirements of the furnace than by the nature of the coal. When the furnace operates at a high temperature, as is the case with a cement kiln, undried coal can often be employed, where in the case of a furnace operating at a lower temperature it cannot. Special operations also require drying of the coal—for example, where a short flame of high temperature is required. At the plant of the Hord Potash Co, lignite containing up to 20 per cent free moisture was successfully handled by an aero-pulverizer heating a rotary kiln.

Aero Pulverizer

One of the oldest forms of self-contained pulverizer and blower is the aero-pulverizer (See Figs. 23 and 24). This consists of three or more communicating chambers, each slightly larger in diameter than the preceding one. A series of paddles mounted on discs, which are in turn keyed to a central, horizontal shaft, revolve in each chamber. An additional chamber at the end of the pulverizer nearest the furnace contains a fan the function of which is to draw finely pulverized coal and air through a pipe to the furnace. The communicating chamber provides the air separation within the unit and an adequate control of the fineness.

The coal is fed into the pulverizer by means of an automatic feed. Some air is also admitted with the coal through inlets in the feeding device. An additional supply of air can be admitted at a point just preceding the fan chamber and the regulation of the air supply used for combustion is usually effected at this point. The pulverizer runs at a constant speed and the supply of coal burned in the furnace is regulated at the feed mechanism of the pulverizer.

One of the outstanding advantages of the aero-pulverizer is the uniform mixture of air and coal obtained in the fan chamber. The thoroughness of this mixture determines more than any other factor the ability to burn coal efficiently, whether coarse or fine, as explained in Part II of this series. This is taken care of in the central plant system by various feeders and burners which have been designed to accomplish this result (See Part IV, to follow). Fuel engineers now generally agree that a uniform mixture of air and coal is fully as important as fineness of the latter and repeated tests which have been made by the Bureau of Standards and other users of pulverized coal indicate that when the mixture of coal and air is complete and the furnace of proper design, moderately coarse coal is burned as efficiently as the fine product.

Owing to the fact that the operation of the furnace is dependent on the pulverizer being in operating condition, it is highly desirable that repairs can be quickly made. The parts most subject to wear are the paddles and lines. The latter have a comparatively long life and the replacements most often necessary are the paddles, hence it is well to provide close at hand an extra rotor with paddles attached, so that repairs can be rapidly effected. The time required to make the change from the old to the new rotor need then not exceed 20 min.

These pulverizers are made in a number of sizes ranging in capacity from 600 lb. of coal per hour to 5000 lb. The horsepower required varies from 10 hp. for the smaller size to 60 hp for the one of larger capacity. Table XIV gives the makers' figures as to size, capacity and normal power consumption of the various sizes of this mill.

TABLE XIV. CAPACITY AND POWER CONSUMPTION OF AERO COAL PULVERIZERS

Size	Capacity	Normal power consumption
A	600	10
B	1000	15
D	1800	25
E	3000	45
G	5000	60

Pulverburner

The Pulverburner is a unit coal machine recently placed on the market by the K-B Pulverizer Corp. of New York, for pulverizing and introducing powdered coal into the furnace in one operation. The apparatus will handle coal ranging in size from 1 in. to 2 in. and reduce is to the necessary fineness for combustion.

It consists of four essential parts which can easily be recognized in Figs. 25 and 26. These are in order: 1. An automatic feeder. 2. A pulverizing mechanism. 3. A separating chamber. 4. A fan.

The automatic feeder is merely a traveling belt, the speed of which is regulated by means of a cam mechanism so that the quantity of coal fed to the machine, and consequently burned, can be controlled. It is so designed that a magnetic pulley can be used with it, although to date none have been found necessary.

The pulverizing mechanism consists of six rapidly revolving beaters which hurl the incoming coal against the breaking blocks and crush it against grinding plates in the bottom of the machine.

The coal is then drawn into the air-separating chamber by means of a current of air which is induced by the fan. The air picks out the fine dust, while the coarse coal is returned to the pulverizing unit for further pulverizing. The fine dust is carried through the fan and blown directly into the furnace.

The advantages claimed for the Pulverburner are that, in common with other unit type pulverizers, it will pulverize undried coal as the passage of the coal through the machine is so rapid that even though moist it has no opportunity to clog. Due to the fact that by means of the air separating chamber the fine dust is removed as rapidly as it is produced, the power consumption is low. Because of intimate mixture of primary air and coal, the combustion is rapid and the flame may be easily regulated.

Rayco Individual Pulverized Coal Unit

This pulverizer has been developed by Raymond Brothers Engineering Co., Chicago, and is recommended by it for small plants where the requirements indicate a unit pulverizer. The Rayco unit consists of a Raymond mill for pulverizing the coal without preliminary drying, a single air supply for separating the powdered coal in the pulverizer and feeding it through a pipe to the furnace, and a standard Rayco burner which receives the fuel mixture direct from the mill.

(To be continued)

Costs of Oil Engine and Other Kinds of Power

Comparison of the Solid Injection Engine with Steam, Gas and Electric Motors

By H. F. Briggs, M. E.*

THE constantly increasing demand for cheaper power has directed the attention of the power using public to oil engines as a solution of the problem. The type of prime mover which uses oil as fuel directly in the power cylinders of the engine is admirably adapted to meet average requirements where low initial costs are combined with simplicity of design and high overall economy.

These considerations have also attracted the attention of the designer, and the use of fuel oil in an internal combustion engine has been in growing favor for some time. It goes without saying that units with a capacity of 200 or 300 hp. cannot reach the ultimate economy of service given by central stations aggregating 10,000 kw. or greater. There is a place, however, in the sliding rates in vogue with central stations, where the cost of service to the user exceeds the cost of similar service by small oil engine-driven units.

By subjecting the cost of small isolated steam-driven units to a careful analysis it is seen that the cost of service by means of oil engine units is cheaper, and that on such points as simplicity of design, depreciation, low cost of operation and general reliability, the oil engine is not the looser by comparison.

Use of Oil Engines Increasing

The principle of injecting the fuel into the power cyclinder of the engine in just sufficient amounts to maintain the desired operation of the engine is so simple and the results so amazingly good that it is inevitable that the use of oil engines in isolated power plants should increase. The rising cost of coal, the ease of procuring oil, of handling and storing it and the high overall efficiency of the oil engine, all are tending to emphasize the economic setting of the oil engine and to give it a permanent place in our great industrial organization.

It is not out of place at this time to define the solid injection oil engine. It is that type of internal combustion engine using oil as fuel in which the oil is injected by mechanical means into the combustion chamber of the machine in just sufficient quantities to maintain the desired speed and power output, and in which the proper timing and duration of charging the oil are best adapted to securing complete combustion of the fuel. The construction of the fuel injection nozzle is such that the solid stream of fuel is converted into a fine spray which burns neither too fast approximating an explosion, nor too slow causing incomplete combustion and leading to undesirable irregularities in firing.

Either Two or Four Cycle

These engines are built on either the two or four-cycle principle, the horizontal or the vertical arrangements and in either single or multi-cylinder units. Various types of design have therefore developed out of which it seems that the two-cycle, vertical, single-acting multi-cylinder engine is in many ways the most preferred type. There are many reasons for this preferment among which are found the low cost of foundations, extreme compactness of construction, accessibility of major parts, light weight per horsepower and low headroom requirements in the engine room. Another attractive feature is the ease with which the engine is adapted to various kinds of loads and types of drives. It is found direct connected to electric generators, reduction gears, centrifugal pumps, ice machines and line shafts. It is belted to flour mills, rock crushers, cotton gins, oil mills, brick presses, elevators and used for other milling purposes. It lends itself admirably to friction clutch or clutch pulley drive, either the solid or the flexible coupling and to any combination of the above.

In order to study the subject comparatively a table, No. 1, showing a cost analysis of power by various prime movers has been prepared. The capacity of the power plant chosen is 225 hp., and the prime movers are assumed as belted to the load. This size and type of drive are taken because the great majority of isolated power plants are not large, and are either belted or direct connected to the load.

An Analysis of Costs

This cost analysis itemizes the initial costs, fixed charges, operating costs and total costs per horsepower and per horsepower year, and are referred to 12 different prime movers. These prime movers have been selected with care as typifying the usual practice met in the average isolated plant, and are as follows:

1. Slide-valve engine, non-conducting.
2. Four-valve engine, non-condensing.
3. Four-valve engine, condensing.
4. Uniflow engine, non-condensing.
5. Uniflow engine, condensing.
6. Steam turbine non-condensing.
7. Steam turbine, condensing.
8. Gas engine (artificial).
9. Gas engine (producer).
10. Diesel oil engine.
11. Solid injection oil engine.
12. Electric motors.

In analyzing costs, material and labor are based on conditions existing in the latter part of 1921. The prices of material and labor vary somewhat from year to year. For purposes of comparison the figures given show the relative relation of the initial and total costs.

Items of Cost

Item 1 shows the various costs per horsepower of the boiler room, stack, breeching, coal bins, etc. No excavation of the building is figured in and the costs of the stack and breeching follow somewhat that of the boiler equipment. The walls are of brick with sheet metal roof and concrete floors. The condensing units show favorably as is to be expected.

Item 2 shows the producer room somewhat smaller than the boiler room but substantially the same otherwise. The cost amounts to $6.65 per horsepower.

Items 1, 3, and 4 show the engine rooms for all types of prime movers under examination. The cost per horsepower is $2.20 less for the oil engines than for the other machines.

The costs of the foundations per horsepower are shown in Item 5 and include the foundation settings for the engine, boiler, stack, feed water and circulating pumps, and feed water heater. The steam turbines show up most favorably on account of the small engine foundations required for these high

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TABLE 1.—COMPARATIVE COST ANALYSIS OF ONE HORSEPOWER-YEAR (225-HP. UNIT) BY VARIOUS PRIME MOVERS

Items making up total cost per horsepower-year (Items 1—12 incl. cover intial cost; items 15—19 incl. cover operation cost)	1 Slide Valve N. C.	2 4 Valve N. C.	3 4 Valve cond.	4 Uni-flow N. C.	5 Uni-flow cond.	6 Steam turbine N. C.	7 Steam turbine cond.	8 Gas engine artificial	9 Gas engine producer	10 Diesel oil engine	11 Solid inj. oil engine	12 Electric motor
1—Boiler room 20x30x20 stack breeching-coal bins	19.30	19.30	18.75	18.45	18.20	19.30	18.20	.....	.....	.....	.....	.....
2—Producer room 15x25x20	.....	.....	.....	.....	.....	.....	.....	.....	6.65	.....	.....	.....
3—Engine room 25x20x20	8.87	8.87	8.87	8.87	8.87	8.87	8.87	8.87	8.87	.....	.....	.....
4—Engine room 15x25x20	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.65	6.65	.....
5—Foundations (mach.)	6.00	6.00	5.98	5.28	5.26	5.00	4.72	5.32	7.54	7.54	5.32	.....
6—Boiler and plant piping	24.40	21.30	22.20	17.73	17.73	24.40	17.73	.....	.....	.....	.....	.....
7—Gas producer—coal bins, etc.	.....	.....	.....	.....	.....	.....	.....	.....	23.26	.....	.....	.....
8—Oil storage and piping	.....	.....	.....	.....	.....	.....	.....	4.44	.....	6.87	5.99	.....
9—Engine and motors	18.30	21.56	21.56	30.90	31.30	13.22	15.50	43.61	59.09	97.95	64.35	21.25
10—Auxiliaries	4.88	4.66	11.95	4.44	11.75	8.42	15.29	.71	.71	2.35	2.15	.....
11—Installation	5.31	5.31	7.51	5.31	7.51	3.23	5.45	7.52	9.75	5.09	2.64	10.10
12—Total initial cost per hp.	87.06	87.00	96.82	90.98	100.62	82.44	85.76	70.47	115.87	126.45	87.10	31.35
13—Interest on investment, depreciation and obsolescence, taxes and insurance	17.41	17.40	19.36	18.19	20.12	16.49	17.15	14.09	23.17	25.29	17.42	6.27
14—Fixed charges per hp.-year	17.41	17.40	19.36	18.19	20.12	16.49	17.15	14.09	23.17	25.29	17.42	6.27
15—Salaries and wages	13.30	13.30	13.30	13.30	13.30	13.30	13.30	6.65	15.95	10.65	6.65	.71
16—Fuel, coal, gas and oil	31.12	24.45	20.50	23.50	17.55	26.05	14.80	37.55	8.50	7.80	9.20	56.60
17—Lubricating oil	.49	.49	.58	.49	.58	.33	.38	1.62	1.62	1.62	1.62	.23
18—Boiler compound, etc.	1.44	1.33	1.17	1.30	.89	1.38	.80	.15	.15	.15	.15	.....
19—Repairs	4.35	4.40	4.84	4.55	5.04	4.15	4.28	3.52	5.94	6.32	4.35	1.32
20—Total operation cost per hp.-year	50.70	43.97	40.39	43.14	37.36	45.21	33.46	49.49	32.16	26.54	21.97	58.86
21—Total initial and operation costs per hp.-year	68.11	61.37	59.75	61.33	57.48	61.70	50.71	63.58	55.33	51.83	39.39	65.13
22—Total initial and operation costs per hp.-hour	2.63c	2.63c	2.30c	2.36c	2.21c	2.38c	1.95c	2.44c	2.12c	1.99c	1.51c	2.51c

speed machines. The concrete with the form work is estimated at $12 per cubic yard.

The costs of the boiler, steam and exhaust piping per horsepower are shown in Item 6. The boilers are of the water tube type and of sufficient capacity to handle the engines connected thereto, while the piping is wrought iron with flanged fittings.

Item 7 shows the costs per horsepower of a simple down draft suction gas producer, coal bins and gas piping for the engine.

Item 8 shows the costs per horsepower of the oil storage tanks and piping for the installation. For the artificial gas engine this item covers the gas piping for the unit.

Item 9 covers the cost of the prime movers per boiler horsepower of the installation. All of the reciprocating steam engines are of 250-i.hp. capacity, which with 90 per cent mechanical efficiency makes 225 b.hp. throughout. Both steam turbines are 225-b.hp. capacity. Likewise all four of the internal combustion engines are of the same capacity. The electric motors comprise a group ranging from 20 to 1 hp. and aggregate 225 hp. The average shows a charge of $21.25 per motor horsepower. The steam turbine leads with the lowest cost per horsepower, while the Diesel oil engine shows the highest and the Solid Injection oil engine is the second highest.

Auxiliaries

The cost of auxiliaries per installed horsepower cover boiler feed pumps and heaters, vacuum and circulating pumps, jet condensers, air compressors and fuel pumps for the oil engines. Nearly all the oil engines are installed in insured buildings and require underground fuel tanks. A small pump is needed to elevate the fuel oil into a gravity tank which supplies the engine direct.

In order to utilize the high speed turbines at the usual revolutions per minute, reduction gears are interposed between the turbine and the load. This adds about $3.54 per horsepower to the auxiliary apparatus of the turbines which is unnecessary for the other prime movers. The auxiliaries of the internal combustion engines are small owing to the meager requirements of circulating water and compressed air for starting. The charge for fuel oil pumps is very small. The auxilary charges are lowest on the gas engine, next on the oil engines which are followed by the reciprocating steam engines, while on the steam turbines they are the highest.

The comparative installation costs are shown in Item 11 and include the services of the erecting engineer and all the incidental expenses that are usual with this class of work. The solid injection oil engine has an installation cost of $2.64 per horsepower followed by the non-condencing steam turbine of $3.23. The other engines range along upward and are topped off by the producer gas engine at $9.75.

The installation charge of the electric motors include wiring, brackets for mounting and the necessary switchboard apparatus for the starting and the protection of the motors. This cost ranges around $10.10 per horsepower.

The interest on the investment is taken throughout as 6 per cent. A depreciation and obsolescence charge is made which amounts to 10 per cent of the initial investment. The depreciation of buildings will be probably around 4 per cent while the apparatus may go as high as 8 to 12 per cent. For the purpose of comparison an average of 10 per cent may be taken. Taxes and insurance are estimated at 4 per cent of the initial cost.

Labor Charge

Item 15 shows the labor charge against

TABLE 2.—FUEL DATA

Type of prime mover	Lb. water per 1 hp.	Lb. water per b. hp.	Amount fuel per hp.-year	Amount fuel per hp.-hr.
Slide valve, N. C.	28	31.1	6.225 tons	4.78 lb.
4-valve, N. C.	22	24.4	4.89 tons	3.76 lb.
4-valve, cond.	17.5	19.45	4.10 tons	3.15 lb.
Uniflow, N. C.	21	23.4	4.70 tons	3.61 lb.
Uniflow, cond.	15	16.6	3.51 tons	2.7 lb.
Steam turbine, N. C.		26	5.21 tons	4.01 lb.
Steam turbine, cond.		14	2.96 tons	2.28 lb.
Gas engine (artificial)			49,800 cu. ft. gas	19.15 cu. ft.
Gas engine (producer)			1.7 tons	1.31 lb.
Diesel oil engine			156 gal.	.45 lb.
Solid injection oil engine			184 gal.	.53 lb.
Electric motor			2150 kw.-hr.	.83 kw.-hr.

TABLE 3.—TYPES OF PRIME MOVERS IN TABLE 1 ARRANGED IN ORDER OF COSTS

(The figures prefixed to amounts in this table refer to types of prime movers in Table 1)

Initial costs per hp.	Fixed costs per hp.-yr	Operation costs per hp.-yr.	Total costs per hp.-yr.	Percentage ratio of solid injection total cost to costs of other types	Per cent of thermal efficiency based on fuel in Table 2
12.....$31.35	12.....$6.27	11.....$21.97	11.....$39.39	11.....	11.....25.2
8..... 70.47	8..... 14.09	10..... 26.54	7..... 50.71	7..... 77.6	7..... 8.58
6..... 82.44	6..... 16.49	9..... 32.16	10..... 51.83	10..... 76.0	10.....29.6
7..... 85.76	7..... 17.15	7..... 33.56	9..... 55.33	9..... 70.7	9.....14.95
1..... 87.00	1..... 17.40	5..... 37.36	5..... 57.48	5..... 68.4	5..... 7.25
2..... 87.06	2..... 17.41	3..... 40.39	3..... 59.75	3..... 65.9	3..... 6.22
11..... 87.11	11..... 17.42	4..... 43.14	4..... 61.33	4..... 64.2	4..... 5.43
4..... 90.98	4..... 18.19	2..... 43.97	2..... 61.37	2..... 63.9	2..... 5.22
3..... 96.82	3..... 19.36	6..... 45.21	6..... 61.70	6..... 63.7	6..... 4.88
5.....100.62	5..... 20.12	8..... 49.49	8..... 63.58	8..... 61.9	8.....23.1
9.....115.87	9..... 23.17	1..... 50.70	12..... 65.13	12..... 60.4	12.....81.0*
10.....126.45	10..... 25.29	12..... 58.86	1..... 68.11	1..... 57.7	1..... 4.08

*81 per cent efficiency of prime mover at coupling.

the power output in terms of 1 hp.-yr. The steam engines will require an engineer and a fireman aggregating $3000 per year. The artificial gas engine will require an engineer at $1500 per annum. The producer gas engine will require an engineer and a producer man totalling $3600 per year. The Diesel engineer is estimated at $2400 per year while the solid injection oil engineer is taken at $1500. The above figures make a charge of $13.30 against the steam prime movers, while the solid injection engine averages $6.65 per horsepower-year. The labor charge against the electric motors is but $0.71, as they require only the attention of an oiler a few minutes daily.

The comparison of fuel costs per horsepower year is very interesting and is shown in Item 16. The data on which this estimate is made are shown in Table 2, which embodies only what is thought to be average practice.

The numbers in the left hand column of Table 2 refer to the various columns in Table 1. The next column of Table 2 shows water rate per indicated horsepower-hour for the reciprocating steam engines. It is admitted that a Meyer expansion valve gear might reduce the amount for the slide valve, but 28 lb. seems to be an average figure and is taken as the basis for this fuel estimate. The 4-valve N. C. and condensing figures are assumed at 22 and 17.5 lb. per indicated horsepower-hour. The Uniflow N. C. and condensing water rates are taken at 21 and 15 lb. respectively.

Items 6 and 7 show the water rates per boiler horsepower-hour for the N. C. and the condensing steam turbines and are taken at 26 and 14 lb., respectively. The boiler horsepower-hour water rates for the reciprocating engines are based on a mechanical efficiency of 90 per cent, and the indicated horsepower-hour water rates are discussed above.

1 Lb. Coal Evaporates 7 Lb. Water

Further assumptions are that 1 lb. of coal will evaporate 7 lb. of water and that one year comprises 2600 operating hours. It is still further assumed that the boiler feed pumps use 3 per cent of the steam required for the engine while the condensing apparatus absorbs another 6 per cent, and that 5 per cent will be used in raising steam and in standby losses.

Using the above data on fuel, the condensing steam turbine heads the list for economy with 2.96 tons of coal per horsepower-year, while the N. C. slide valve shows a maximum of 6.225 tons. It is interesting to note that the second best economy is the Uniflow condensing engine with 3.51 tons per horsepower-year. The third best is the 4-valve condensing engine with 4.1 tons, while the N. C. Uniflow engine is a close fourth.

Many gas engines are operating on artificial or illuminating gas ranging from 550 to 600 B.t.u. per cubic foot. Taking an average of 757 B.t.u. per foot, 1 hp.-yr. will require 49,800 cu. ft. of gas. This assumption is made on a net thermal efficiency of 23 per cent for the gas engine.

Producer Gas

A producer gas engine will deliver 1 hp.-hr. on 1.25 lb. of coal with an additional 5 per cent for building and banking fires. This is equivalent to 1.7 tons of coal per hp.-yr.

The Diesel engine will use 156 gal. of fuel oil per horsepower-year which makes 1 hp.-hr. on 0.45 lb. of fuel oil and shows an overall thermal efficiency of about 29½ per cent.

The solid injection oil engine will give 1 hp.-yr. on 184 gal. of fuel oil or 0.53 lb. per horsepower-hour. This performance shows an overall thermal efficiency of 25 per cent.

The electric motors are charged with current on the following basis: Assuming that 225 hp. be delivered to the coupling of a generator and that a double efficiency of 90 per cent be met in the generator and the motors, then only 182 hp. will be delivered at the motor pulley. This power amounts to 56.60 per horsepower-year using the rates in vogue at one of the largest municipal plants in Indiana. This amount is used in the table in Item 16 for the electric motors.

In Table 1 the cost of fuel is based on coal at $5 per ton delivered, gas at 75c. per 1000, and oil at 5c. per gal.

The last column of Table 2 shows the amount of fuel required to produce 1hp.-hr., all losses included .

Referring again to Table 1, Item 17 shows the cost of lubrication for the engine and all the auxiliary apparatus. This item shows highest on the internal combustion engines where 1300 hp.-hr. of complete lubrication is secured on 1 gal. of lubricant. The electric motors show up the best owing to the simple requirements for lubrication.

The boiler compound is charged off at nominal rate and is lowest in the internal combustion engines where the jacket water is subjected to treatment to avoid scale and other insoluble precipitates in the water jackets of the engine.

The repairs are taken at 5 per cent of the initial cost.

Referring now to Items, 12, 14, 20, and 21 of Table 1 the initial cost per horsepower, the fixed charges per horsepower-year, the operating costs per horsepower-year and the total costs per horsepower-year are found for all the prime movers under discussion. These results have been rearranged in Table 3 giving the lowest values first.

Thus we see that the electric motors have the lowest initial cost per horsepower and fixed cost per horsepower-year, but the highest operating cost per horsepower-year and next to the highest total cost per horsepower-year.

The solid injection oil engine heads the list with an operating cost per horsepower-year of $21.97 and a total cost per horsepower-year of $39.39, while it stands seventh in initial cost per horsepower and fixed charges per horsepower-year.

The condensing steam turbine ranks second as total cost per horsepower-year and fourth as to initial cost, fixed charges and operating costs.

The Diesel oil engines rank third as to total cost per horsepower-year, second as to operating costs, but highest as to initial costs and fixed charges.

The 4-valve condensing engine ranks sixth as to the total cost per horsepower-year and operating costs, and ninth as to initial costs and fixed charges.

The slide valve non-condensing engine ranks highest as to total cost per horsepower-year, next to the highest as to operating costs, and fifth as to initial costs and fixed charges.

Substituting solid injection oil engine drive for electric motor service a gain of $25.74 per horsepower-year is effected. Since the initial cost of solid injection engine is only $87.11, the savings each year would pay for the initial investment in 3.3 years, and amount to a gain of 29.6 per annum. In 10 years the net savings will amount to $257.40 per horsepower besides having enough in the depreciation fund to replace the original investment.

The fifth column in Table 3 shows the ratio of total cost of one horsepower-year by the solid injection oil engine to the total cost of power by the other prime movers. By inspection it is seen to range from 77.6 per cent in the case of the condensing steam turbine to 57.7 per cent for the non-condensing slide valve engine.

Thermal Efficiency

The last column in Table 3 shows the overall thermal efficiency of the various prime movers based on the amounts of fuel required as per Table 2. It is interesting to note that this efficiency for the solid injection oil engine is 25.2 per cent, the condensing steam turbine 8.58 per cent and the Diesel oil engine 29.6 per cent. The steam engine efficiencies range from 4.08 per cent for the slide valve N. C. engine to 8.56 per cent for the condensing steam turbine. The efficiency of the electric motor and generator is given as 81 per cent, but it must always be taken in connection with the efficiency of the prime mover at the coupling. The efficiency of the direct-connected unit would be 81 per cent of, say in case of the condensing steam turbine, 8.58 per cent which equals 6.94 per cent.

The horsepower cost by solid injection oil engines does not vary much due to the change in the size of the unit, and would be about the same for a 100-hp. oil engine as for a 225-hp. unit. These engines are being applied directly to the load more and more and it is no uncommon thing to find pumping plants comprising two or more direct-connected oil engine units. These engines are also being direct connected to electric generators and they are run in parallel with other machines. They can be regulated closely and synchronized from the switchboard the same as any other engine.

Owing to the increasing difficulties of

securing coal the engine is gaining in popularity. A 12,000-gal. tank car of oil has 0.31 per cent more British thermal units than a 50-ton car of coal. Since the steam engines mentioned above operate on a thermal efficiency of 4.08 to 8.58 per cent, the car of oil will produce from 5 to 8 times as much power burned in a solid injection oil engine as the car of coal will produce used as fuel with the steam engines.

These oil engines however are real machines and require skilled attention, and when this is supplied will prove themselves thoroughly reliable and dependable. These characteristics combined with simplicity of design and cheapness of power output make them the ideal prime mover for the isolated power plant.

What Makes a Good Concrete Sand?

Characteristics of a Good Fine Aggregate Explained According to the Theories of Different Authorities

By Edmund Shaw
Editor of Rock Products

CONCRETE sand might be described in one way as "that part of the aggregate which passes a ¼-in. square mesh screen," since, in screening sand and gravel, everything below this size is considered to be sand. There is more to the definition than size, however, for, according to the accepted theory of concrete making, the fine aggregate plays a somewhat different part than the coarse. Hence, a better definition would probably be, "that part of the aggregate which joins with the cement to form the mortar which unites the larger pieces of coarse aggregate."

Whatever kind of coarse aggregate is used, crushed stone, slag or gravel, it is rarely that any other form of fine aggregate than natural sand is employed. For this reason it is customary to consider concrete sand apart from the other constituents of concrete, and to make separate specifications for it. The standard for comparison is Standard Ottawa Sand, not so much because this is a particularly good concrete sand as that it is very uniform, and the company which produces it has taken care to preserve this uniformity. It is thus an excellent standard for comparison, which is used and understood all over the United States. [For a description of the characteristics of Ottawa sand see article in ROCK PRODUCTS, September 22, 1923, page 28.]

Comparison with Standard Sand

Standard Ottawa Sand will make a briquet with the usual proportion of cement that will resist from 325 to 350 lb. in tension; sometimes more than this. This is good sand test, and there are many natural sands used which will not equal it. On the other hand, there are many sands which will do better. The best sand which has come to the writer's knowledge is from a plant in North Carolina which showed a tensile strength of 182 per cent of Ottawa sand, when washed. An Ohio washed sand showed 142 per cent and sands from New York state have shown varying strengths from 125 to 150 per cent of Ottawa standard. There is evidently reason for the intensive study of concrete sands which has been made everywhere in the United States and which is still going on.

It may be stated at the outset that there is no single test that will decide the value of the sand for making concrete, except the strength test. Grading, the proportioning of the different mesh sizes, is perhaps the most important characteristic, but sands with practically the same grading from different localities may give different strength tests. The shape as well as the size of the grain has something to do with the strength of the resulting mortar. It is possible that this is one reason why screenings from crushed stone have sometimes failed in comparison with sand, as they are often thin, flat scales that have little strength. Rock crushed to sand size will give equal or better results in a strength test than natural sand.

Importance of Cleanliness

The importance of having the sand clean and free from organic matter and deleterious minerals, such as mica, shale and pyrite, is too well understood to need discussion here. At present there is a disposition to place too much value on the colorimetric test for organic matter and to turn down any sand that shows a dark color with the standard sodium hydroxide solution. Sometimes this is carried to a ridiculous point, and the sand is rejected in the face of strength tests that show it to be of excellent quality for concrete making. This has happened with sands which contain small quantities of lignite, which hardly affects the strength of the concrete at all, although it does hurt the sand for finishing purposes.

On the other hand, there are sands from swampy localities along the Atlantic coast that contain so much organic matter that they will not make concrete at all. Briquets made from them will crumble in the fingers after several days' standing. In a locality where such sands are found, the colorimetric test is of the greatest importance. But, in the main, the value of this test is only that of a warning to indicate that further tests should be made before the sand is accepted.

The Limiting Size

The limiting size of concrete sand has been fixed by custom at ¼-in., and a ¼-in. screen is generally used in sand and gravel plants on this account. There is a growing tendency to use a larger screen, ⅜-in. or even ½-in., and in the writer's opinion this is the right thing to do. Unquestionably the precious grains in sand are between ⅛-in. and ⅜-in., and for one natural sand that has too many of these coarse grains there are probably a hundred sands that have too few. State highway departments generally recognize this in permitting a certain percentage of "plus ¼-in."

The writer has seen a series of tests made to determine this point, in which the rise in strength was directly proportional to the increase in the production of grains between ⅜-in. and ⅛-in. for the particular sand tested.

Grading

Grading has been spoken of as the most important characteristic of a good concrete sand, and the state highway departments have given a great deal of study to the best grading for sand. A fairly general rule is that not less than 30 per cent of the sand must remain on a 20-mesh sieve. Some states are more particular and give the maximum and minimum permitted in each size. An example of this sort of specification is that published by the state highway department of New Jersey, as follows:

Passing	Retained on	Minimum, per cent	Maximum, per cent.
½ in.	¼ in.	0.0	1.0
¼ in.	10 mesh	5.0	25.0
10 mesh	30 mesh	30.0	60.0
30 mesh	50 mesh	20.0	40.0
50 mesh	200 mesh	5.0	15.0
200 mesh	.....	.....	5.0

The reason why the presence of these sizes is necessary is that uniformity in grain size must be avoided to keep down the percentage of voids. The more nearly of the same size

the grains are, the higher will be the percentage of voids.

Theory of Concrete Mixing

One reason why no one is willing to commit himself as to just what the characteristics of an ideal sand would be is that the whole theory of mixing concrete is still somewhat vague. There are three standard methods of proportioning, which apply as much to the mortar of the concrete as to the complete mix. There are: (1) proportioning by voids, (2) proportioning by water ratio and (3) proportioning by surface area.

Proportioning by voids is the oldest theory, and such mixtures as 1:2:4 are founded on that theory. If one has a cubic foot of sand that weighs 110 lb. and knows that a cubic foot of the solid rock would weigh 165 lb., he knows that 33.3 per cent of the space occupied is voids. If he is to have a solid concrete, he must fill up these voids with cement. Otherwise there will be voids, or unoccupied spaces in the mortar after it has set. In the case given, he would have to use half as much cement as sand, and (assuming that the coarse aggregate will contain the same proportion of voids as the sand) he will come out with the ordinary 1:2:4 mixture.

If his sand had weighed only 100 lb. to the cubic foot he would have had to use 13 per cent more cement to fill the voids, or his mortar would have been weak from the unoccupied spaces. Even where the voids have been determined, it is necessary to use 5 or 10 per cent more cement than is indicated, as the voids in a wet mixture are greater than in a dry mixture.

Voids in Fine Sand

Good concrete sands have voids running around 30 per cent. Fine sands have often as much as 45 per cent of voids, which explains why such sands should never be used for concrete. One government test showed that fine sand took seven times as much cement to make a strong mortar as a good concrete sand would take.

Proportioning to water ratio is due to the work of Prof. Duff A. Abrams, who has made thousands of tests to show that the strongest concrete is that which requires the smallest ratio of water to solids to give the required consistency of mix. This is somewhat complicated to explain briefly, so the reader is referred to Professor Abrams' book, The Design of Concrete Mixtures, for a full explanation.

In brief, he determines the water ratio from the "modulus of fineness." This is obtained by screening the sand through the 4, 8, 14, 28, 48 and 100-mesh screens of the Tyler standard system. The *cumulative* per cents on each mesh size are then added together and the total divided by 100. The result is the modulus of fineness.

Fine sands tested in this way will have a modulus of fineness as low as 1.25 and good concrete sands 2.75 to 3.00 and even higher.

This is a simple and useful method of comparing sands, regardless of the theory on which it is based, and the writer has used it with excellent results while he was employed in engineering work. On one sand in particular, on which a number of tests were made, it was found that the strength of the mortar in compression could be quite accurately predicted by finding the modulus of fineness. The Abrams method has recently been used on some very large constructions.

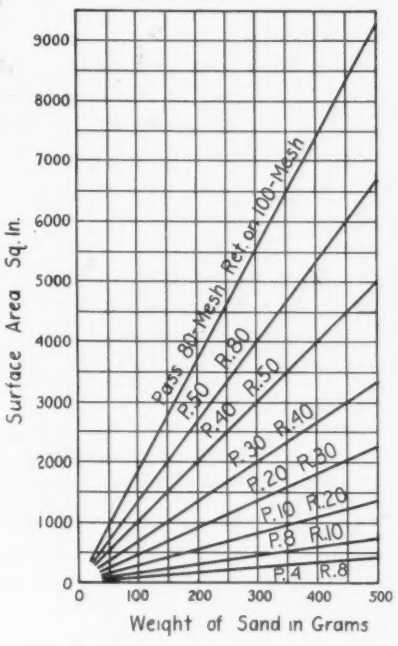


Chart showing relation of surface area to size of grain

Surface Area

Proportioning by surface area is due to the work of Mr. L. N. Edwards. He has shown that all mixes which have the same ratio of cement to surface area of the aggregate (as 1 g. of cement to 10 sq. in. of surface area, for example) have the same strength. Hence, the sand which has the least surface area will take the least cement for a mortar of the same strength.

Mr. Edwards' tests show that Ottawa sand has 4.3 sq. in. of surface area per gram. Sand between 80 and 100-mesh has 18.6 sq. in. per gram. Hence the same amount of cement would make more than four times as strong a mortar with Ottawa sand as with this fine sand.

The chart gives the surface inches for the different sizes of sand for weights of sand up to 500 g.

Many engineers consider the Edwards method the most direct and satisfactory method of proportioning concrete. The aggregate is screened and the weight of cement needed is found at once by figuring the surface area.

Within a considerable range, it will be found that the results obtained by finding the fineness modulus and by finding the surface area will not vary more than 5 or 10 per cent. And both the surface area and the modulus of fineness are indicative of the percentage of voids.

Summary

To sum up: A good concrete sand should have

(1) At least 30 per cent of grains coarser than 20-mesh, and not too much uniformity in grain size.

(2) A percentage of voids not to exceed 35 per cent, which means that it should weigh around 110 lb. per cubic foot.

(3) A modulus of fineness of at least 2.75, to agree with the laboratory test the writer has seen made to determine this point.

(4) A surface area not more than 4 sq. in. per gram, or the strength will be less than that of Standard Ottawa Sand, according to the surface area theory.

The Eotvos Balance Locates Large Masses of Rock

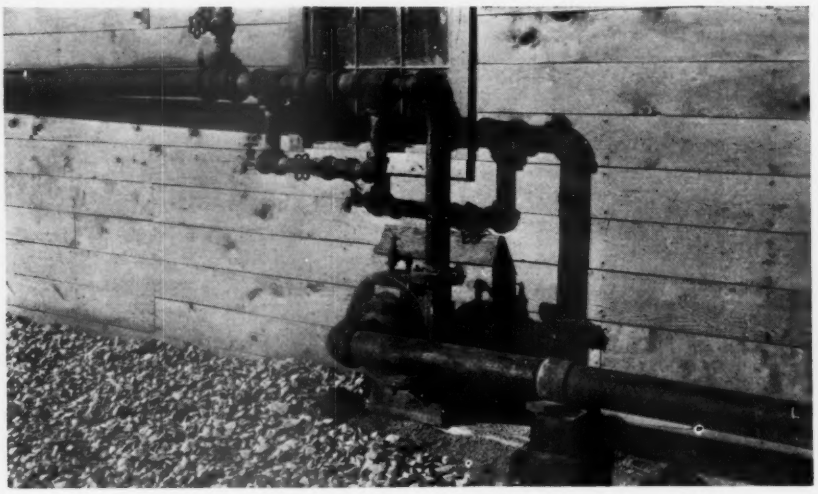
THE *Engineering and Mining Journal* of October 6 describes the apparatus invented by the late Baron Eotvos, professor of physics at the University of Budapest for locating large masses of rock below ground. The principle upon which the apparatus is based is that slight differences in the "pull" of gravity are noted where there are variations in the density of the earth's crust, and these differences may be measured and recorded by a delicate torsional balance. The apparatus is exceedingly sensitive, much more so than the most delicate analytical balances used in chemical laboratories. This sensitiveness in grams is expressed by 1 divided by 10 raised to the 12th power.

The change in the force of gravity is shown by the torsion exerted on a very fine wine as observed through a telescope. A photographic method of recording has been devised. As the machine is so extremely sensitive it has to be set up in a tent and carefully guarded against changes in temperature, and only a carefully trained expert can handle it successfully.

So far the practical use of the apparatus has been the location of anticlines for the drilling of oil wells. Drill holes put down in the territory surveyed checked very closely the information given by the instrument in the survey.

Unquestionably the use of this instrument (which really does in part what the "divining rod" was supposed to do) will be of great importance in geologic surveys and consequently of our knowledge of the earth's crust.

Hints and Helps for Superintendents



A by-pass around a check valve for priming a pump

Scheme for Priming a Centrifugal Pump

PRIMING a centrifugal pump which is set higher than the suction always involves some special arrangement. Perhaps the commonest method of solving the problem is to put a gate valve in the discharge line. This valve is closed as soon as the pump stops and this holds enough water in the discharge line to prime the pump before starting it again.

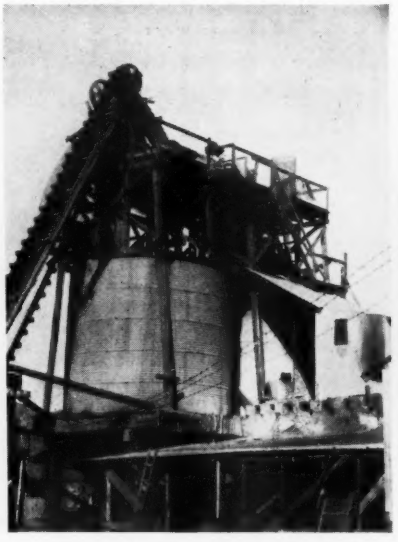
The objection to this method is that the pump may stop at a time when no one is near enough to close the valve. If the foot valve leaks, as foot valves usually do after they have been in service for a while, the discharge line and pump will be emptied and there will be no priming water to use when the pump is to be started again.

The cut shows how this difficulty may be overcome. A check valve (or non-return valve, as it is often called) is placed in the line near the pump. A by-pass runs around the check and a valve in this by-pass keeps the water from passing through it under normal conditions. When the pump stops the check valve automatically closes and holds the water in the discharge line. Before starting, the valve in the by-pass is opened and the pump primed by the water flowing through the by-pass.

Sand Bin of Corrugated Iron

THE cut shows a sand bin in use in a California sand plant that has the advantage of a low first cost. It is made of ordinary corrugated iron siding, of the same sort that is so much used for covering warehouses and similar structures.

It will be noted that the corrugations run around the tank and in this way act as reinforcing. A tank built in this way is much stronger than one would think it would be, judging only from the appearance of the light metal. The writer has seen deep water tanks made in this way which not only stood the pressure but



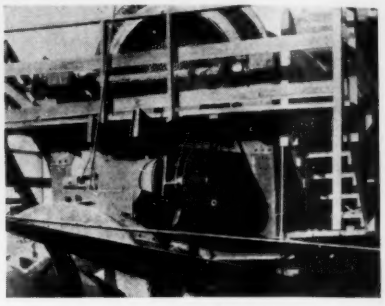
Sand bin of corrugated steel

gave a number of years of service.

Corrugated metal made of a special iron is rust-proof and is much used in some parts of the counrty for culverts and flumes. A bin made of such metal could be used for wet sand and would give a sufficient length of service. Such metal would possibly be too light to use for gravel.

Simple Method of Driving a Screen

THE cut shows a simple method of driving a screen which is in use at the Big Te Junga plant near Los Angeles, Calif. The screen in this case is above a conveyor belt which takes the product of



Screen drivers from conveyor

the screen, and a sprocket on the head pulley of this conveyor carries a chain that drives the pinion shaft of the screen.

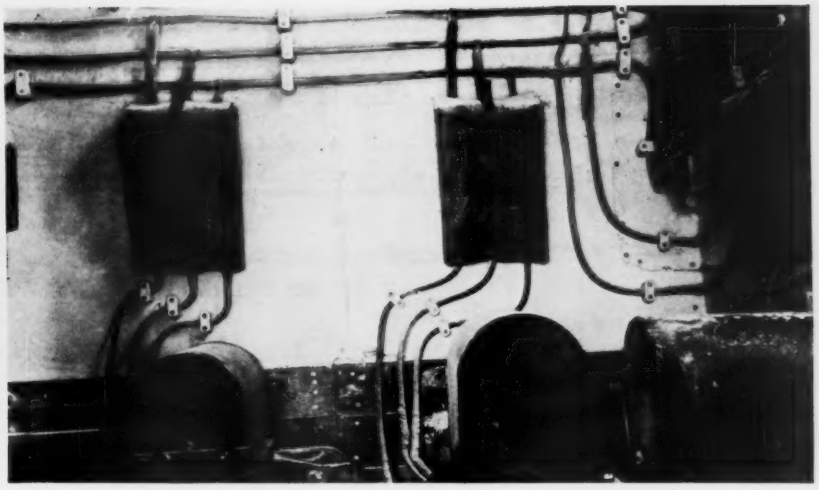
This same arrangement may be used in a variety of ways. Head pulleys of both elevators and conveyors may be utilized to drive screens in this way. However, there are some engineers who prefer to give the screen its own motor.

Tent for summer home

Tents for Temporary Shelter

A TENT of the sort illustrated makes a fairly comfortable habitation to be used while construction work is going on or as a shelter for cement and other things that have to be kept out of the rain. It pays to take a little trouble to fix up such a tent by putting up board sides and laying a floor. Those who were in the army camps of the war-time period will know all about such construction.

Example of switch box made of old belting



Two switch boxes completely covering switch—belting sewed together at corners

Use for Old Belting

WE have illustrated a number of uses for old conveyor belting, but none perhaps that could save such small pieces as shown here. The views herewith illustrate how one of the plants of the Western Lime and Cement Co. in Wisconsin uses pieces of old belting to make switch boxes.

Another type of protected switch not entirely enclosed

An open switch is something to be avoided, of course, in every rock products plant because of the danger to workmen in operating them. Also in a lime plant, or stone plant, protection from the dust is desirable for the sake of the efficiency and life of the switch.

Combination Dryer and Conveyor for Sandy Material

THE cut, which is from the *Engineering and Mining Journal-Press*, shows an unusual combination of dryer and conveyor invented by W. R. Wade and used in the Northern Ore Co.'s plant at Edwards, St. Lawrence county, N. Y. It is working on pyrite, but it would probably work even better on sand.

The motive power is furnished by a jet of compressed air at 90 lb. pressure delivered through a ⅛-in. nozzle. This acts as an injector and drags with it a current of hot air from a furnace of the ordinary type, such as one might build to heat a boiler, for example.

The pyrite, which has all passed 12-mesh and much of it is minus 100-mesh, is fed into the dryer by the screw shown above. It falls down into the stream of hot air and is carried along with it for 80 ft. It could be carried considerably farther without much loss in efficiency. The temperature in the pipe at the hot end is 700 to 900 deg. Fahr., and 100 deg. Fahr. at the discharge end. This is found to be ample to dry the material handled.

The compressed air is heated to obviate the cooling effect of expansion when leaving the jet.

The designer has given the coal consumption and cost of operation as follows, based on an output of 300 tons per 24 hr.:

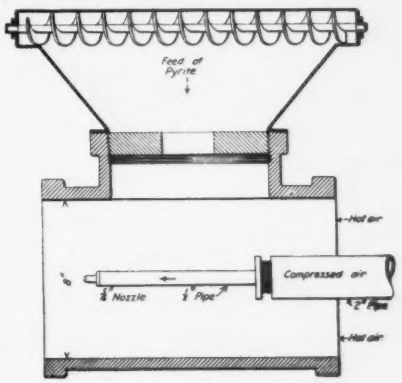
To dry 100 tons daily of granular pyrite from 4½ per cent moisture to 1 per cent moisture:
Time required, eight hours.
Compressed air needed, 120 cu. ft. free air per minute at 90 lb. receiver pressure.
To compress 100 cu. ft. free air per minute requires 24 hp. Cost of power per 100 tons dried and transported, $1.70.

Coal required:	Pounds
To head induced air	360
To heat jet air	90
To evaporate water	380
To heat pyrite	100
For radiation losses	300
Total per 100 tons pyrite	1230

Cost of operation per 100 tons:	
Power	$1.70
Coal at $8 per ton	4.90
One operator at $4	4.00
	$9.60

Cost per ton, 9.6 c.

On the basis of drying from 4½ to 1 per cent moisture, the coal consumption figures out to 5.7 lb. of water evaporated for 1 lb. of coal burned. For comparison, one of the large producers of blast and filtered sand informs ROCK PRODUCTS that in drying sand from 5 per cent moisture down to less than 1 per cent he finds that 6.6 lb. of water are evaporated for each pound of coal burned. This is with dryers of the ordinary cylindrical form and two types of dryers are in use.



A novel dryer

However, the drying and conveying 80 ft. at a cost of only 9.6 c. per ton appears as a somewhat remarkable record.

Ford to Build 30,000 Homes of Cement

ERECTION of 30,000 homes on a 5000-acre tract of land south of the Dearborn plant of the Ford Motor Co. is planned by the Ford company, Henry Ford has announced. The houses are to be constructed of cement, according to a plan perfected by Thomas A. Edison.

The plans call for pouring the cement into a set of forms and these molds then can be arranged into 12 different types of houses, it is asserted. The lumber is to be obtained from short pieces of timber usually allowed to go to waste.

The houses will be sold to any person who desires to buy them and at a price close to cost, Mr. Ford said.—*Rochester, N. Y., Journal.*

Big Week for Rock Products Operators—St. Louis, January

Crushed Stone and Sand and Gravel Conventions Will Attract Hundreds of Live Wires

STARTING Monday, January 21, the National Crushed Stone Association will hold its annual convention at the Statler Hotel, St. Louis, Mo. The program committee, consisting of E. J. Krause, vice-president and general manager of the Columbia Quarry Co., St. Louis; A. P. Sandles, secretary of the association; and Nathan C. Rockwood, editor of ROCK PRODUCTS, have already outlined a program that no live quarry operator can afford to miss. The manufacturers' division of the association now comprises 45 members, and provisions are being made for an exhibit of models, moving pictures, etc., such as the industry has never before seen. The opportunity is afforded operators of getting first-hand, up-to-the-minute information on every phase of the quarry industry.

Below is a brief outline of some of the doings in store for the stone industry. This is a tentative program only. Suggestions from all will be gratefully received:

Monday—January 21, 1924—10 A. M.

Address of Welcome—The Mayor of St. Louis
Reply on Behalf of Association—President Schmidt
Annual Message of the President—President Schmidt
Ten-Minute Reports of the Directors for Their Respective Localities Covering:

(1) Review of Industry—Production; Demand; Prices
(2) Relations With Railways—Rates; Car Service; Ballast
(3) Labor Situation—Scarcity or Surplus; Wages; Immigration; Methods of Overcoming Shortage
(4) Outlook for 1924 in relation to (1), (2), (3)

Noon Get-Together Luncheon—Good Local Speaker
Afternoon Session—2 P. M.

2:00—Design of Crushing Plants
2:30—Operating Problems and Their Solution—Subjects Suggested by Operators
3:30—New Machinery and Equipment—Moving Pictures

Evening

8:00—Theater Party

Tuesday Morning

10:00—Depletion, Depreciation and Income Tax
10:30—Cost Accounting
11:00—Report of Labor Committee—Discussion of Labor and Wages; Discussion of Immigration and Labor

T R. BARROWS, executive secretary of the National Sand and Gravel Association, Washington, D. C., is as busy as a bee on a program that is going to make every attendant of the convention a better operator. Working with him is a program committee consisting of C. A. Homer, vice-president and general manager of the Missouri Portland Cement Co., St. Louis; John Prince, president of the Stewart Sand Co., Kansas City, Mo.; H. H. Halliday, president and general manager of the Halliday Sand Co., Cairo, Ill.; and O. S. Conrades, of St. Louis.

The date of the National Sand and Gravel Association convention is coincident with that of the National Crushed Stone Association, except that it starts on Monday, January 21, with a directors' meeting and the general sessions will not start until Tuesday, January 22. The convention will be held at the Chase Hotel, which is near Washington Park, about five or six miles from the center of the city.

Many members have promised to bring their superintendents and operating men, and especial attention will be given to making the program valuable from the operating side. Moreover, those in charge of the convention are anxious to make it a convention of the whole industry, and non-members as well as members of the association will be made welcome. Announcements of some of the speakers will be made in the near future.

Mr. Barrows has already got top-notch speakers on the open-top car situation and on the federal-aid road outlook. Experienced sand and gravel operators are to be picked to open discussions on the subjects outlined in the following tentative program:

Tuesday

10:00 A. M.—Business Session
11:00 A. M.—"Exploration, Development and Valuation" of Sand and Gravel Deposits
"Depletion, Depreciation and Income Tax Problems"

Luncheon—Well-Known Speaker
Afternoon—2 P. M.

"Geology of Sand and Gravel Deposits"

Afternoon—3 P. M.

Symposium on "Transportation and Transportation Equipment"

(Crushed Stone Program Continued)

Luncheon by Groups

2:00—Electric Power Contracts
2:30—Selection of Motors and Electrical Equipment
3:00—Blasting and Drilling
3:30—Transportation
4:00—Crushing
4:30—Screening
5:00—Stock Piling

Annual Banquet

Wednesday Forenoon

10:00—Appointment of Committees—General Business
10:30—Ten-Minute Talks on How the National Crushed Stone Association Can Develop Further Usefulness
11:00—Report of Research Committee
11:30—Application of Geology to Quarrying

Lunch by Territorial Groups

Afternoon

2:00—How to Use Advertising Space to Best Advantage
2:30—Selling Quarry Products
3:00—Outlook for Highway Work in 1924
Outlook for Railway Work in 1924
Outlook for Municipal and Public Work in 1924
Outlook for Building Industry in 1924

Optional on Thursday

Excursion to Plant of the Columbia Quarry Co.
Agricultural Limestone Meeting

(Sand and Gravel Program Continued)

(a) "Advantages of Steam Locomotives and Large Size Standard Gage Cars"
(b) "Advantages of Gasoline Locomotives and Small-Unit Cars"
(c) "Conveying With Cableway Dragline Excavators"
(d) "Barges for Sand and Gravel Transportation"
(e) "Pumps and Pipe Lines on Conveyors"
(f) "Storage and Shipping Facilities"

Tuesday Evening—Annual Banquet

Wednesday

10:00 A. M.

Symposium on "Operating Problems," "Stripping," "Steam-Shovel Maintenance," "Dragline Advantages," "Pump Maintenance," "Grizzlies," "Conveyors," "Screens," "Sand Recovery and Sizing," "Crushers"

Afternoon

"Ton vs. Cubic Yard as a Basis of Selling"
"Advertising"
"By Products as Openings for Surplus Material"
"Concrete Brick," "Mixed Mortar Plants"
Motion Pictures of Mixed-Mortar Plant Operations
Motion Pictures of Concrete Brick Manufacture
Motion Pictures of Columbia Digger Co. Operations, Portland, Oregon
Motion Pictures of U. S. Bureau of Public Roads

Thursday

Optional—Excursion to Missouri Portland Cement Co.'s Sand and Gravel Plants

Chicago Cement Prices Reduced

THE Universal Portland Cement Co. has reduced its price on cement to dealers 10 cents a barrel to $2.40 f.o.b. cars Chicago (including bags). Other cement companies doing business in this district met the reduction.

An official of Universal Portland Cement said recently that business this fall has continued in very good volume and he pointed to the steady gain in building permits each month as the explanation. Good weather has favored the industry and, according to the official, much construction work will be carried on during the cold weather which a few years ago would not have been attempted.

Dallas Firm Gets Big Lime Contract

PROBABLY the largest construction lime order in this part of the United States for a single building was sold recently by W. H. Hitzelberger, manager of the Michel Lime Co., which is one of Dallas' oldest manufacturing plants. The order was for all the lime to be used in the construction of the Santa Fe railway terminal warehouse buildings amounting to 18,000 bbl. or more than 60 carloads. This order will be filled from the plant of the company in West Dallas and the material from which it is made will be quarried from the hills bordering the Trinity river on the company's land about three miles west of the courthouse.

The Michel Lime Co. has been manufacturing lime in Dallas for more than 40 years and its product is used in a great many of the buildings of the city. The plant is on the edge of the highest hills in West Dallas and overlooks the entire business section of the city.—*Dallas (Texas) Herald.*

U. S. Gypsum Company Prosperous

DIRECTORS of the United States Gypsum Co. recently declared a stock dividend of 20 per cent, payable December 31, to common stockholders of record December 5. This company in consequence of the record-breaking building activity has had a highly prosperous year.

The United States Gypsum directors also declared the usual quarterly cash dividend of $1 a share on the common stock and $1.75 a share on the preferred. Inasmuch as the par value of the common stock is $20 a share, the 20 per cent stock dividend requires a charge of only $4 a share against surplus, although its market value is greatly in excess of that, with the stock selling above 80. In 1922 the company earned 67.66 per cent, or $13.53, a share on the common, and it will not be surprising if this year's results are even better. A year ago a stock dividend of 10 per cent was paid and in each of the two preceding years stock dividends amounted to 5 per cent.

New Financing for Vulcanite Portland Cement Co.

TWO Pennsylvania firms announce the offering of a new issue of $600,000 of Vulcanite Portland Cement Co. first mortgage 20-year sinking fund 7½ per cent gold bonds due in 1943. The bonds are being sold at par and are secured by a first closed mortgage on all the company's property, which is in the form of plants at Vulcanite, N. J., and limestone deposits at Brownstone, Pa. Proceeds will be used to retire an existing mortgage of $160,000, to liquidate bank loans, provide additional capital and to reimburse the company for the cost of new equipment now being installed. The offering companies are Schibener, Boenning & Co. of Philadelphia and McLaughlin, MacAfee & Co. of Pittsburgh.—*New York Times.*

Portland Cement Output in October, 1923

Last Month Makes New Record of Production, According to the Recent Report of the Geological Survey

THE statistics shown in the following tables issued by the Department of Interior, and prepared under the direction of Ernest F. Burchard of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for October, 1923, were made necessary by the lack of returns from three plants. October production is the record for any month; shipments increased over those of September and are exceeded in 1923 only by those of August. Stocks, although diminishing, did not reach the low level of October, 1922. Production for 10 months in 1923 has nearly reached the total for the year 1922 and shipments thus far are slightly in excess of the total for 1922.

Stocks of clinker, or unground cement, at the mills at the end of October, 1923, amounted to about 3,007,000 bbl. compared with 3,379,000 bbl. (revised) at the beginning of the month.

The Bureau of Foreign and Domestic Commerce of the Department of Commerce reports that the imports of hydraulic cement in September, 1923, amounted to 215,785 bbl., valued at $379,906. The total imports in 1922 amounted to 323,823 bbl., valued at $628,846. The imports in September were from Sweden, 57,513 bbl.; Denmark, 49,583 bbl.; Belgium, 35,846 bbl.; Canada: Quebec and Ontario Provinces, 30,514 bbl.; British Columbia and Yukon, 2937 bbl.; Maritime Provinces, 30 bbl.; Norway, 29,579 bbl.; other countries, 9783 bbl. The imports were received in the following districts: Los Angeles, 99,442 bbl.; Porto Rico, 23,317 bbl.; Hawaii, 22,930 bbl.; Buffalo, 12,284 bbl.; Buffalo, 12,284 bbl.; Florida, 10,163 bbl.; Vermont, 9323 bbl.; St. Lawrence, 8906 bbl.; New York, 7811 bbl.; New Orleans, 6917 bbl.; San Francisco, 6041 bbl.; South Carolina, 4546 bbl.; other districts, 4105 bbl.

The exports of hydraulic cement in September, 1923, were 77,121 bbl., valued at $216,564, of which was sent to Cuba, 25,928 bbl.; to the other West Indies, 13,645 bbl.; Central America, 14,162 bbl.; South America, 12,535 bbl.; Mexico, 7574 bbl.; Canada, 1082 bbl., and to other countries, 2195 bbl.

The statistics of imports and exports of hydraulic cement in October, 1923, are not available.

Production record for month and year are given in tabular form.

IMPORTS AND EXPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1922 AND 1923, IN BARRELS*

Month	Imports 1922	Imports 1923	Exports 1922	Exports 1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	111,559	96,263	77,203
July	957	286,106	119,491	82,774
August	56,757	323,948	105,156	73,201
September	‡42,641	215,785	78,615	77,121
October	§65,228	(†)	80,402	(†)
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
Total	323,823	.....	1,127,845	.....

*Compiled from records of the Bureau of Foreign and Domestic Commerce. †Imports and exports in October, 1923, not available. ‡Covers period September 1-21. Imports September 22-30 included with October. §Includes imports period September 22-30.

County Land Bought for Tennessee Cement Plant

AN agreement has been reached between Jas. O. Parker, promoter of the million-dollar cement plant to be erected near Crab Orchard, Tenn., and Chairman J. F. Brown for the purchase of the property there owned by Cumberland county. The land where the proposed plant is to be erected is owned by the county. An option secured by Mr. Parker on this land expired a few weeks ago, but not before he had sent a deed here to be properly signed transferring the property to the company. The company was incorporated a few weeks ago as a Davidson county corporation. Chairman J. F. Brown asked the promoters to have the company incorporated as a Cumberland county organization, but this the promoters declined to do. An agreement has just been reached between the promoters and Chairman J. F. Brown, whereby deed for the land is to be made to the promoters and placed in escrow here in a bank.

The proposed plant is to cost in the neighborhood of a million dollars and will employ, it is stated, about 500 men. The promoters claim that all the chemical ingredients necessary for the production of cement are found on the property to be purchased.—*Nashville, Tenn., Banner.*

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN OCTOBER, 1922 AND 1923, AND STOCKS IN SEPTEMBER, 1923, IN BARRELS

Commercial district—	Production—October, 1922	Production—October, 1923	Shipments—October, 1922	Shipments—October, 1923	Stocks at end of October, 1922*	Stocks at end of October, 1923	Stocks at end of September, 1923*
Eastern Pa., N. J. & Md.	3,340,000	3,342,000	3,403,000	3,922,000	1,091,000	1,055,000	1,635,000
New York	642,000	731,000	769,000	864,000	263,000	380,000	513,000
Ohio, Western Pa. & W. Va.	1,315,000	1,266,000	1,423,000	1,412,000	308,000	159,000	304,000
Michigan	687,000	925,000	685,000	980,000	157,000	177,000	232,000
Illinois, Indiana & Kentucky	1,860,000	1,933,000	2,143,000	2,056,000	354,000	272,000	395,000
Va., Tenn., Ala. & Ga.	590,000	838,000	607,000	844,000	275,000	272,000	279,000
Eastern Mo., Ia. & Minn.	1,255,000	1,452,000	1,250,000	1,448,000	333,000	625,000	622,000
W'n Mo., Neb., Kan. & Okla.	924,000	979,000	907,000	935,000	630,000	697,000	652,000
Texas	330,000	332,000	321,000	326,000	161,000	227,000	221,000
Colorado & Utah	208,000	217,000	237,000	206,000	149,000	174,000	163,000
California	806,000	1,049,000	819,000	1,021,000	196,000	283,000	256,000
Ore., Wash. & Mont.	330,000	286,000	290,000	271,000	232,000	276,000	261,000
	12,287,000	13,350,000	12,854,000	14,285,000	4,149,000	4,597,000	5,533,000

*Revised.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT BY MONTHS IN 1922 AND 1923, IN BARRELS

Month	Production 1922	Production 1923	Shipments 1922	Shipments 1923	Stocks at end of month 1922*	Stocks at end of month 1923
January	*4,291,000	7,704,000	*2,931,000	5,419,000	13,316,000	*11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	*13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	11,848,000	*13,045,000
First quarter	15,254,000	25,669,000	13,218,000	21,708,000	.....	.....
April	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	*11,463,000
May	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	*10,144,000
June	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	* 9,168,000
Second quarter	31,664,000	36,651,000	34,811,000	40,518,000	.....	.....
July	11,557,000	12,620,000	13,850,000	13,712,000	8,433,000	* 8,081,000
August	11,664,000	12,967,000	14,361,000	14,971,000	5,746,000	* 6,080,000
September	11,424,000	13,109,000	12,444,000	13,698,000	4,724,000	* 5,533,000
Third quarter	34,645,000	38,696,000	40,655,000	42,381,000	.....	.....
October	12,287,000	13,350,000	12,854,000	14,285,000	4,149,000	4,597,000
November	11,349,000	.....	10,167,000	.....	5,320,000	.....
December	8,671,000	.....	4,858,000	.....	9,267,000	.....
Fourth quarter	32,307,000	.....	27,879,000	.....	.....	.....
Preliminary total	113,870,000	.....	116,563,000	.....	.....	.....
Amount of under estimate	919,984	.....	1,138,216	.....	.....	.....
Final total	114,789,984	.....	117,701,216	.....	.....	.....

*Revised.

Year 1924 Should Be Good for Road building

But Don't Let Meddling Politicians Cut Down Federal-Aid

EVERY so often politicians discuss the need of cutting down government expenses and usually such cuts are suggested for things that are of the most importance to the public. They never talk about cutting their own salaries, or the costs of their various junkets to Europe, China, Panama, or somewhere else, which, if accomplished would build a good many miles of necessary roads. In view of the figures below (from an editorial in the New York Times) such politicians will do well to suggest cuts in other directions than federal aid for highway work in 1924.

Motors and Roads

Further incidental evidence of the high mobility of the American people is seen in the figures just given out by Secretary Wallace of the Department of Agriculture. He reports that the Federal Government has collected $589,012,021 in taxes upon automobiles and automobile accessories since 1917, when the first federal tax was laid upon the selling price of automobiles, etc., and their passenger use. During the same period the Federal Government has spent on account of federal aid for highway and forest road construction, together with all administrative outlays, only $264,782,216. Thus the users of our roads and those most benefited by highway improvements contribute directly in motor taxes more than twice as much as the Federal Government spends in highway improvements. As the total number of motor cars and trucks on July 1 was somewhat more than 13,000,000 and the entire federal revenue from taxes on them for 1922 amounted to $146,000,000, the contribution per car was only $11.

The whole is only about one-seventh of the annual fuel bill paid by motor vehicles and one-third of the annual tire bill. The total investment in automobiles is nearly $9,000,000,000. It is the boast of the residents of several of the Mid-Western states that each one could be emptied of its inhabitants in a single day by the use of all the motor cars and trucks owned in the state and without overcrowding the cars as we do our subways. Sometimes the congested conditions of the highways suggest that such an exodus is in progress! At any rate, the people of a given state are not interested alone in their own roads and have good reason to urge that what is paid in automobile taxes and fees should be spent promptly and equitably for road maintenance throughout the country as a whole.

When it comes to the states the same policy should be followed. In the state of New York the total motor vehicle income last year amounted to more than $12,000,000, and it is estimated that the income this year will reach $18,000,000. It is due to those who pay these taxes to get a return in roads suitable for motor car use. Meanwhile, as Secretary Wallace says, the Federal Government should proceed with all practicable speed to complete the trunk lines in all the states. They have a great unifying as well as economic value.

Cost of Road Materials in California

SAND, gravel, crushed rock and rock screenings will cost the city of Santa Barbara more this year than they did a year ago, according to City Manager Fred Johnston, and for this reason the city council ordered that a contract for only a 60-day period be entered into between the city and the Western Motor Transfer Co.

The Western company was the only bidder for the city contract, quoting both imported and local rock. The total cost of rock, sand and gravel for the year, according to the street superintendent's estimate will be $2895.50 for imported rock and $2627.50 for local and imported material.

The following is the scale of prices in the company's bid opened by the council last night:

	Imported	Local	Last Year
Sand	$2.85	$2.85	$2.85
Gravel	3.50	3.50	3.35
Crushed rock, 2	3.75	3.25	3.80
Crushed Rock, 3	4.00	3.50	3.95
Crushed Rock, 4	4.00	3.50	3.95
Rock screenings	2.80	2.50	3.95

—*Santa Barbara (Calif.) News.*

Wisconsin Paved 430 Miles with Concrete in 1923

THE question of obtaining an adequate supply of cement for state highway construction which has brought worry to state officials for years is expected to be at least partially answered by the production of the state's first cement plant at Manitowoc which will be in operation soon with an initial expected production of 1,000,000 bbl. for the first year. Transportation is one of the big costs in obtaining cement and during the season just closing the state paid $1.75 a barrel for cement of which cost about 60 cents was for transportation.

With most of the paving projects in Wisconsin ending November 1, the state will have laid about 430 miles of concrete pavement this year, according to a report of the State Highway Commission.

Cement cost the state a trifle more this year than it did last year. It cost the state about $30,000 a mile to build concrete roads, but this cost was inclusive of all the expense involved.

Tests are being made by the State Highway Commission of the durability of different kinds of roads that have been laid. For this purpose cylinder shaped sections of roads are drilled out and taken for testing to determine which can bear the most weight.

The highway department reports that the state had no trouble in obtaining sufficient cement during the year in comparison with the difficulty of obtaining a sufficient quantity in years past.—*Western Builder.*

South Dakota Soon Will Have 1227 Miles Improved Road

AT the bidding for gravel highways in the offices of the State Highway Commission of South Dakota this week contracts were let for 111 miles of gravel on the state highways. The contracts let, along with the gravel work under way and contracts completed, give the state 1227 miles of gravel highway.

The trunk line highways soon will be graveled clear across the state, the present contracts calling for gravel on the Black and Yellow highway, from the east line of the state to the river, with several gravel stretches west of the Missouri river. The same condition exists as to the other trunk lines, and as soon as they are fully graveled the work will be extended.—*Sioux City, Ia., Journal.*

Cement Plant at Three Rivers, California

AFTER conducting a series of borings and other experiments during the past few months, the San Joaquin Portland Cement Co. will, it is reported after hearing the engineers' reports, commence the construction of a cement plant near Three Rivers.

The exploration work has been done by means of core drilling and holes from 266 to 517 ft. deep have been drilled, and the engineer in charge of this work has stated that in one small portion of the territory there is enough lime to supply the proposed plant for a period of eight years.

With the construction of a plant it will also be necessary to build a railroad from Lemon Cove to Three Rivers and two routes are under consideration, one on the north side of the Kaweah river and the other to follow the course of the present paved highway. A survey made some time ago shows that it would be necessary to cross the highway too many times to be practical, and plans are under way for a resurvey of both routes.—*Hanford, Calif., Sentinel.*

Sand Company Asks Damages

A CLAIM for $52,756 has been filed against the state of New York by the Fred Pierce Sand Co. of Volney, near Minetto, for damages alleged to have been done to the company's pits because of the closing of the old Oswego canal, which was the only means of transportation open to the company. The claim was presented at the Court of Claims in session in Syracuse.—*Oswego, N. Y., Pall.*

Indiana Annual Road School at Purdue University

THE Tenth Annual Road School under the auspices of the School of Civil Engineering, Purdue University, Lafayette, Ind., in co-operation with the Indiana State Highway Commission, Indiana County Highway Superintendents' Association, Indiana County Surveyors' Association and the Street Commissioners' Association, will be held January 7 to 11, 1924.

The Program Committee, consisting of Professor C. C. Albright, highway engineering; Ben H. Petty, associate professor of highway engineering of Purdue University; J. J. Griffith, secretary of the Indiana County Engineers' Association; Fred W. Connell, chairman of the Indiana County Highway Superintendent's Association, have just about completed all arrangements for the annual event. Some very prominent federal government, state and county officials will appear on the program.

Indiana has the only law in the United States compelling county officials to attend the annual road school for one week. At the coming session of the legislature, 1925, it is hoped that a law can be passed covering the county engineers as well as the county superintendents of maintenance.

The coming road school program will cover very thoroughly construction and maintenance of every type of highways, also Indiana laws affecting road construction and maintenance. Records and accounts of county officials will be discussed by Lawrence Orr, chief examiner, State Board of Accounts. Railroad crossings and road signs will also be gone into very thoroughly. In fact, every hour from the time the school convenes until it closes on the afternoon of January 11 will be taken up with the important questions confronting officials that are building and maintaining our public highways.

Says Building Business Is Facing One Best Year

THE building business is facing one of its biggest years, Thomas J. Vernia, president of the Indiana Limestone Association, stated in reviewing the reports of 1924 prospects from a thousand Indiana cities and towns.

"Work started last spring was beyond the capacity of the industry, but we are now getting settled down to the point where we can meet demands," he declared.

The greatest building year in history throughout the nation was predicted by Vernia. For three and one-half years business men have been postponing building programs waiting for lower construction costs. Next spring the avalanche of new building will begin, he predicted.—*Portland (Ind.) Review.*

Death of George D. Loomis

GEORGE DUDLEY LOOMIS, well known in the quarry industry and president of the Loomis Machine Co., died at his home in Tiffin, Ohio, November 1.

Mr. Loomis was an outstanding figure in the business and social life of his town, as he was president of the Tiffin National Bank and of the Tiffin Wagon Co. He was prominent in Masonic circles, having been both a Knight Templar and a 32d degree Scottish Rite Mason, and he was a member of several other organizations. He was everywhere known for his cordiality and he had

George D. Loomis

the rare gift of friendship which will make him long remembered by those whom he met. He was a student at Ann Arbor, which he had to leave when the Civil War called him to work in his father's foundry and machine shop. Here he began that thorough education in the design and manufacture of machinery which was the basis of the success of his own business in later years.

The quarry industry will remember him as a manufacturer of blast hole drills, as he had much to do with the development of these machines and their introduction in the rock products industries. The friends he made in this work will sincerely regret his passing.

Indiana Gravel Plant Burned

THE engine and boiler room of the Interstate Sand and Gravel Co., located on the Rogers farm across the river, was discovered on fire about 9 o'clock the other evening, and the chemical wagon made a quick run to the scene, but was called too late to check the flames, and the building and part of the machinery, at least, is a total loss, with only partial insurance.

The fire puts the company practically out of business for the rest of the season.—*Covington, Ind., Republican.*

Kenneth E. Casparis Joins Comal Rock Co., Texas

KENNETH E. CASPARIS, recently with the Casparis Stone Co., Connellsville, Pa., a son of the founder of the company, which has many plants, has resigned to become manager of the quarry and plant of the Comal Rock Co., New Braunfels, Texas, effective November 19.

Mr. Casparis was literally born in the crushed-stone industry, his father being a pioneer quarry man of Columbus, Ohio, with plants in Indiana, Maryland, Pennsylvania and Ohio. Kenneth, Ind., the location of one of the newest plants, was named for him. He is well known in the crushed-stone industry not only because of his ancestry and early training with his father's company, but through his later connection with the Wisconsin Granite Co., Chicago, for which he had charge of the building of plants at Dell Rapids, S. D., Alexandria Bay, N. Y., and the rebuilding of the Utley plant.

Later Mr. Casparis had charge of mining operations in Alaska for his father.

Suit to Prevent Mining Gypsum Under Cemetery

IS a cemetery association allowed to lease the ground beneath the graves to a mining company?

That is one of the questions the Appellate Division of the Supreme Court will have to decide next month when it convenes in Rochester for its December session, according to a Rochester, N. Y., news dispatch.

Suit was brought in the name of William Briggs of Akron, Erie county, against the Bloomingdale Cemetery Association and the American Cement and Plaster Co. of Chicago, the firm that obtained the mining rights to the cemetery which lies near Akron.

Books on record and briefs have been filed and the attorneys are prepared to argue the appeal on an injunction order granted to Briggs by the late Justice Marcus, sitting in a Buffalo Supreme Court.

According to complaint of Briggs, the cemetery association leased the mining rights to the Chicago cement firm which expects to take gypsum from the ground beneath the graveyard. Directly after the contract was signed, however, Briggs and several other members of the cemetery association objected and filed the injunction suit.

The complaint states the company will be forced to blast 60 or 70 ft. undergronnd in order to obtain the gypsum and that irreparable loss and damage to the plaintiff will be done.

The cemetery association, in its answer to Briggs, sets forth a claim, however, that the blasting will in no way harm the graves or the tombstones. Expeience with blasting near buildings for subways, etc., would seem to prove this assertion reasonable.

The New Alumina Cement

American Authority Dissuccs Its Manufacture in the United States

[The following, reprinted from the Manufacturers' Record, is by Edwin C. Eckle, Washington, D. C. Mr. Eckle is one of the well known American authorities on cements.—Ed.]

PORTLAND cement has now been in use as our leading artificial structural material for almost exactly 100 years, and for many purposes it is likely to continue in use for many decades longer. But for certain special uses, and among these certain very important uses, it now seems likely to be replaced by one of the newer types of cement, made specially to satisfy special requirements. The new cements here referred to are the alumina cements, a term which I have applied in order to avoid using specific brand names, and which seems likely now to be adopted officially when the new cement is placed on the American market next spring.

The alumina cements are strictly "new" only in the sense that they are novelties to the American engineer; they have as a matter of fact been made and used for some 15 years in France and elsewhere in Europe, and they have established a certain definite success along certain definite lines. Their replacement of portland cement for such special uses is not based on competition in price, for the alumina cements are dearer than portland, but on superiority in quality for the particular uses to which they are put.

Alumina cements have two valuable technical properties. They are, first of all, particularly resistant to chemical attack, and have been used successfully in sea-water and in grounds soaked with alkaline waters, where ordinary portland cements had failed. Their second important technical property is the quickness with which they attain their total strength; a concrete made with alumina cement will give in a day or two, tensile and compressive tests equal to those given by a portland concrete a month old. All of these facts have been thoroughly established during some 15 years experience in Europe, and they are not stated as arguments but merely as summaries of current engineering knowledge of the alumina cements.

As to technical details, the alumina cements differ markedly from portland cement in their raw materials and in their manufacture. So far as the first point is concerned, they use limestone and bauxite as raw materials—a point which is of particular interest to the South, where all of our known bauxite deposits are located. So far as manufacture is concerned, the alumina cements are commonly though not necessarily made by complete fusion in a furnace, rather than by clinkering in a rotary kiln, as are the portlands. The reason for this difference in proceau.e is economic rather than technologic; witn a mix high in alumina and low in lime it is easier to fuse completely than to semi-fuse or clinker; and if one intends to fuse a mix, the furnace is far cheaper than the rotary.

It is probable that the first heavy output of alumina cement in this country will be made this winter and next spring in one of the Northern states, because of market conditions. But so far as cheapness of manufacture is concerned, localities where limestone, bauxite and coke can be assembled most cheaply will ultimately have the preference for coldly commercial reasons. It is therefore reasonable to assume that within a few years the South will have a far larger proportion of this new industry than it has of the existing portland cement industry.

The limitations on the cement as suggested above will arise if at all not from technical considerations but from high cost raw materials. At present the cheapest source of such materials are the lower grade bauxites, for which no market has hitherto been available; but it is by no means certain that this dependence on a bauxite supply will continue for many years longer. Investigations now in progress on a very large scale—also, it may be noted, in a Southern state—suggest that we may be on the verge of securing a far cheaper source of alumina than bauxite, not only for the alumina cement industry but for other purposes.

Control of British Portland Cement Company Acquired by H. S. Horne

THE Associated Portland Cement Company, which controls $65,000,000 worth of capital and nearly 90 per cent of the industry, according to the *Daily Express*, has been secured by Henry S. Horne, partner of Reid & Bridgestock, well known stockbrokers of London.

Horne, it is said, realized three years ago that the arrangement of the company's captial was such that it would give any group an opportunity of gaining control and he set to work to buy the shares. He bought so skillfully in the open market that the board had no knowledge that its authority was being undermined.

Such, however, was the case. The old directors have cleared out and the company has been turned into a new one, with the name, the Associated Anglo-Atlantic Corporation, and with Sir Philip Nash as chairman. Sir Philip made a brilliant war record under Sir Eric Geddes. He reorganized the railway transport in France, and holds among other positions that of chairman of the Metropolitan Vickers Co.

It is understood that those behind the new company think the control of the British industry in the past has not sufficiently realized its great potentialities, nor has it appreciated the demand which is likely to be forthcoming for cement throughout Europe and the dominions, and indeed, both hemispheres.—*New York Times.*

Atlas Cement Company Leases Large Areas of Clay and Limestone Land

THROUGH the lease of a large tract of land along the "Ridge" in Eldred and Ross townships, Penn., the Atlas Cement Co., a leading industry of the section, is making plans in a business way for great expansion.

Perhaps nothing in the history of the West End has caused so much comment in relation to the expanding field and need of the clay products mined in the region mentioned, as this latest move of the corporation.

It is well known that as some of the "lodes" of the company run out, negotiations are at once concluded for the extension of the enterprise. It can only be concluded that a large number of men will, in time, be engaged in the mining and hauling of the clay.

Information came early this week that the Atlas Company had leased of James Beemer, in the Eldred section, a total of 760 acres of land, along the Ridge—a spur of the Blue Mountain. The fact that this is less than half of the amount of land just leased is also learned, as it is stated "options" were closed on 1000 acres more than leased of Mr. Beemer.

Coincident with the knowledge of these large leases extending in the neighborhood of a mile, comes the news that the limestone field will be developed also in this part of the county by the Atlas concern. Important deposits of limestone which surveys and research have uncovered lend fuel to the contention that lime will be turned out on the ridge tract.

The peculiar white cement which is made from the soft rock found has a splendid sale, it is learned. It is utilized in many products.

Mining of the light-white clay has been going on for years, sometimes with more vigor than in other periods, but continually the product has been going out. It is the "prime" of the white cement of commerce, which is in great demand.—*Stroudsburg, Penn., Press.*

[The Atlas Co. is one of the few manufacturing companies which make white cement in the United States.—Ed.]

New Ulm, Minn., Stone Crusher Will Double Its Capacity

DEMAND for New Ulm crushed rock, the product of the New Ulm Stone Co., which is operating a plant at Redstone, has become so great that it was necessary for the concern to make plans for enlarging the capacity of the plant. The work has been started and will be pushed rigorously until the machinery is installed and the plant ready for operation next spring. Superintendent August Widell states that it is not expected the improvements will be finished before March 1. Mankato men are interested in this enterprise.

Before the plant was shut down preliminary to commencing the improvements, the capacity was 500 tons of crushed rock per day. This capacity will be doubled with the addition of new modern machinery during the coming winter.

A monster gyratory Traylor Bulldog crusher, the product of the Traylor Engineering and Manufacturing Co. of Allentown, Pa., will be installed. This crusher has a capacity of about 100 tons of crushed rock per hour. This crusher will take a rock 3 ft. sq. and turn it into crushed stone. The gyratory crusher to be installed will take a 20-in. rock and convert it into pieces 2¼ in. in size. There are two smaller crushers at the plant at the present time. Both are of the gyratory type.

The screening capacity of the plant will be more than doubled and an elevator will be installed for the purpose of hoisting the product after it has gone through the crushers to the screens, where it is separated into different sizes. These are operated in a vibratory manner, which greatly adds to the effectiveness.

The capacity of the present building will necessarily have to be doubled to house the new machinery. This will be added on the east. Workmen will pour the foundation for the new crusher in several days and within a short time carpenters will be busily engaged in the erection of the addition over this foundation.

The big bins in which the crushed rock is stored are also to be greatly increased. Cement piers are now being erected for this purpose and the bins will be extended a story higher than at present. The capacity will be 800 tons of crushed rock. In addition to this the concern has on hand for emergency 1100 tons in a pile near the plant.

During the present summer there have been from 28 to 30 men employed at the local plant. About two-thirds of these reside in New Ulm. This industry is of great assistance to New Ulm and when it is considered that the present season's output has been between 50,000 and 55,000 tons of crushed rock, or about 1000 cars, it is seen that New Ulm crushed rock is finding a ready market.

The president of the local concern is G. A. McLaughlin of Mankato, while N. W. Pugh of that city is secretary and treasurer. August Widell, the superintendent, was formerly a resident of that city.—*Mankato, Minn., Press.*

Chicago Company to Open Lime Quarry Near Cordova, Ill.

THE Jipson Lime Co. of Chicago has purchased 45 acres of land 1½ miles south of Cordova, Ill., and expects to employ 300 men when work of getting out limestone is going full blast. Cordova citizens are rejoicing over the boost to their town. The land sold for about $300 an acre, and was owned by Hans Hansen and John Hetz. The deal was closed last week.—*Moline, Ill., Dispatch.*

Los Angeles Changes Crushed Rock Specifications

THE city council is scheduled to adopt today the ordinance changing the specifications for rock used in city streets, sidewalks, curbs and gutters as recommended by the Board of Public Works, City Engineer Griffin and the majority members of the council. These officials worked out the new specifications so as to throw open to wide competition the bidding on rock for city paving and other improvements and to reduce the cost to property owners. At the same time the new specifications provide for engineering tests that will insure improvement in material and work done.—*Los Angeles Times.*

Weathering Tests of Stone

WEATHERING tests, consisting of freezing and thawing of the specimens until disintegration occurs, are in progress at the Bureau of Standards on 22 samples of limestone and 23 of sandstone. Some of the best limestones have withstood 800 freezings without showing any appreciable amount of decay, while the poorer grades of this material were disintegrated by 100 freezings, says the *Scientific American.* Tests on the sandstones have only recently been started, and so far the samples have shown no great amount of decay.

A number of limestone and sandstone specimens are also being tested by soaking in a 15 per cent solution of sodium chloride and drying afterward to obtain a crystallization of the salt in the pores of the stone.

This produces an action similar to that of frost, but more severe. It has been found that limestones which stood up under several hundreds of the freezings were disintegrated by less than 100 crystallizations in the salt test. However, the actual disintegration seems to be similar to that produced by the action of frost, and hence it is believed that there is a possibility of using this method as an accelerated weathering test.

One Phase of the Stone Industry Passing

[The following account of the closing of a great business illustrates the changes that are taking place in the quarry industry. During the time that the business spoken of here has declined four large rock crushing concerns have sprung up in the same field and found a very profitable market for their product. Such changes do not indicate decay but progress and they are going on in every advancing industry.—Ed.]

WESTERN Stone Co., the stock of which was one of the speculative favorities on the Chicago Stock Exchange more than a score of years ago, ended its career this week with the closing of its office in the Chamber of Commerce building. The property of the company has been acquired by the holders of the first mortgage 6 per cent bonds under foreclosure and all proceeds from the sale of the assets will go to them, owners of the $100,000 of second mortgage 6 per cent bonds and $2,250,000 of capital stock receiving nothing.

Ever-changing styles in construction work and the advent of gravel and concrete were responsible for the troubles of the Western Stone Co., according to former officials. When flagstones went out of general use for paving purposes the company was forced to make its output suitable for other purposes. Crushed stones were in demand for a time in building, but when gravel showed its adaptability at a lower cost, the company found something like $750,000 of practically useless machinery on hand. The value of its lands and quarries dropped thousands of dollars an acre to in the hundreds. This is the explanation for the dissipation of assets.

In the three years following the incorporation of the Western Stone Co. to succeed to the business of a half dozen stone companies it earned sufficient money to pay annual dividends ranging from 8 to 10 per cent on the capital stock. Except in 1897, when 2 per cent was paid, further dividends were declared until in 1905 when a 4 per cent rate was established. Payments were continued until near the end of 1907 when the final disbursement was made. Operations were suspended entirely about eight years ago and since then the company has been in the course of liquidation, title to the properties having been obtained a month ago by the first mortgage holders' committee. The stock was stricken from the list of the Chicago Stock Exchange last week.

No discount has been made of the properties, located at Chicago, Lemont and Lockport, by the mortgage holders. Attempts will be made to sell the plants, machinery and land and the belief of the committee is that the holders of the first mortgage will receive more than 100 cents on the dollar for their claims.—*Chicago Journal of Commerce.*

"Invisible Track" Highway to be Tried in Kentucky

THE State Highway Commission of Kentucky is experimenting with a type of highway that has often been proposed by those who wish to draw an analogy between the highway and the railroad.

The track, which corresponds to the rails of a railway, consists of two parallel beams of reinforced concrete set 5-ft. centers. These are covered with rock asphalt or similar surfacing material. In order that the truck wheels shall find this track the road surface is slightly deformed so that the tracks will lie in a shallow rut. The rise between the tracks are only 3 in. deep so that the vehicles can turn out to pass without any difficulty.

The space between parallel tracks, where two are used, and the road surface at the sides of the tracks is covered with what is known as inverted macadam penetration. This will support the weight of the lighter vehicles which have to turn out of the way of the trucks.

The design is due to S. B. Morse. It is expected that the cost of this type of highway will be about $11,000 per mile. It is said that Louisiana and other southern states may try a similar experiment.—*Abstracted from Roads and Streets.*

Big Contract for Gravel

A CONTRACT was closed by the Watson Co., contractor for the erection of the Santa Fe railway terminal warehouse building with the Harston Sand and Gravel Co. for all the gravel that is to be used in the construction of the new building.

This is believed to be the largest gravel contract ever awarded to a Texas firm and calls for more than 85,000 cu. yd. or more than 5500 carloads. C. E. **Kraft, general** manager of the Harston company obtained the contract for his firm.—*Dallas (Texas) Herald.*

Another California Crushed Rock Plant

AN important industrial addition to Ontario, Calif., was seen in the purchase by the American Crushed Rock Co. from L. J. Cree of a 65-acre tract to the west of the city and the announcement of that concern that they will at once erect a plant which will give employment to 50 men and cost approximately $150,000.

In addition to the 65 acres just purchased the crushed rock company has leased from the Fleming estate a tract of 160 acres for a period of 25 years, with the privilege of purchase. The crushing plant, the clearing of ground for which is already under way, will have a capacity of 60 carloads a day. The land just purchased or leased lies between the Santa Fe right-of-way and Tenth street.

The plant is to be equipped with new and modern machinery and will manufacture nine rock products, which will supply the needs of many kinds of construction work. The output will go principally to railroads, municipalities and large contractors.

Rock is to be taken first from a 40-acre piece lying between the tracks of the Los Angeles-San Bernardino line of the Pacific Electric Railway and Tenth street and will be carried to the crushers, a distance of 300 ft., by means of a conveyor belt, which will pass under the Pacific Electric tracks.

When this tract is stripped to a level it is planned to improve and beautify the grounds and establish an amusement park there, according to W. J. Flynn, general manager and director, and P. D. Richards, engineer.—*Los Angeles Times.*

Sand and Gravel Man Becomes City Manager

CHARLES E. DOUGLAS, formerly city manager of Lawton, but more recently head of the Oklahoma Industrial Sand and Gravel Co., operating on Cache creek, west of this city, has received word that he has been elected city manager of Newport News, Va., at a large salary increase.

Douglas was city manager of Lawton for two years, but was relieved of his duties when the mayor-aldermanic form of government, which years ago was superceded by the commission form, was reinstated at an election last spring.

During the World War Douglas was a major in the engineering corps of the American army, seeing extensive service overseas, where he is credited with building a large part of the American railroads constructed during the war period in France.

Douglas obtained the position at Newport News in competition with a score of others.—*Oklahoma City (Okla.) Oklahoman.*

Big Sums for Public Works

DURING the next four years more money will be expended here upon municipal improvements than during any similar period in the city's history, says a Philadelphia correspndent of the Chicago *Daily News.* As a result of the recent election the mayor and city council will be in accord after January 1 and sums amounting to $21,270,507, which have accumulated because of disagreements, will be available for expenditure. Fifty million dollars has also been voted for road work in the state and no delay in floating a loan for that amount is anticipated.

Iowa Sand and Gravel Producers Protest State Royalty

REPRESENTATIVES of the Iowa Sand and Gravel association have protested against the proposal of the state board of conservation to charge private concerns three cents a ton for sand and gravel taken from meandered streams.—*Humeston, Ia., New Era.*

Oklahoma Asphalt, Sand and Gravel Companies May Be Reincorporated

THE general office of the Continental Asphalt & Petroleum Company has been moved from Oklahoma City to Shreveport by Houston B. Tehee, receiver. Whether the company's Dougherty, Okla., asphalt and sand and gravel properties will be placed under control of a separate corporation, as had been planned by the company, depends upon the outcome of the receivership.

Robert W. Dick and R. E. Stafford, former officials of the company, and owners of the Continental building in Oklahoma City, have temporarily retired from the oil business.—*Oklahoma City, Okla., Oklahomian.*

Indiana Sand and Gravel Producers Convention

THE ninth annual convention of the Indiana Sand and Gravel Producers Association will be held at the Lincoln Hotel, Indianapolis, Tuesday and Wednesday, November 20 and 21.

Won't Accept $1,000 for Acre of Gravel

GILCHRIST & GILCHRIST appeared before Judge DeLand, in Albert City, Iowa, and appealed to the district court the condemnation proceedings against James A. Pyle, in which the board of supervisors are attempting to secure part of the Pyle farm, in section 2, Coon township, for a gravel pit and road. The gravel pit requires 67 acres, and the road was 67 acres, and the road was to use 12 acres. The appraisers fixed the price at $1000 per acre for the pit, and $50 for the road. He has appealed.—*Waverly, Iowa, Ind.-Rep.*

Proposes to Use Prison Labor in City Owned Quarry

LOCATION of a municipal rock quarry in Kansas City, Kans., will be made soon by Henry Schaible, street commissioner. Materials for repairing pavement and the construction of rock walls by the city will be taken from the quarry.

Schaible asserted he would ask that prisoners at the Argentine work house be allowed to work in the city quarry.

It is estimated that $10,000 will be saved annually by the quarry. The city expends annually $15,000 for rock to repair streets and do other work. The material is purchased from rock companies.

Under the operation of a city rock quarry the city will be able to crush enough rock in the winter months to do all repair work needed on the streets. It will be a saving of time as well as money, Schaible asserted. —*Kansas City, Kans., Kansan.*

Birmingham Slag Co. Starts New Gravel Plant and Secures a Big Order

SAND and gravel, to be used in the great hydro-power plant on the Tallapoosa river at Cherokee Bluff, by the Alabama Power Company, has been contracted for through the Birmingham Slag Company, it has been announced.

Upwards of 15,000 carloads of sand and gravel will be required on this immense job and, as has been the policy of the power company since its start, all of its possible purchases have been made in the state and in that direction where new development is given an impetus.

Following the announcement is the further statement that the Montgomery Gravel and Sand Company will be organized at once and that property purchased at Mt. Meigs, in Montgomery county, 15 miles east of Montgomery, on the Atlanta and West Point Railroad, will be developed at once. C. B. Ireland, assistant general manager of the Birmingham Slag Company, will be general manager of the Montgomery Gravel and Sand Company, and will be in charge of the offspring of the Birmingham concern. Headquarters will be established in Montgomery, and a corps of salesmen and operating force to be employed, the gravel and sand business to be developed on a large scale and the business to be conducted in the same manner as has been done during the past seven years in the slag line.

Announcement of the biggest sand and gravel contract ever given a single company in the south was made Saturday afternoon by H. G. Ireland, vice-president and general manager of the Birmingham Slag Company, who is also to be president of the Montgomery Gravel and Sand Company.

During the present week machinery will be purchased so that development of the Mt. Meigs property can be started at once, shipment on the immense contract to be started within 90 days and steady movement of the product kept up for at least two years, in which time the Alabama Power Company proposes establishing another of its very large hydro-power plants in the state.

The Montgomery Gravel and Sand Company will mean a development that will bring about investment totaling around $150,000, and the plants call for electrically driven machinery throughout the Alabama Power Company to get transmission lines to the plant just as quickly as the machinery is received. Shipment of gravel and sand from Mt. Meigs will be by the Atlanta and West Point Railroad to Union Springs, and thence by the Birmingham and Southeastern to Eclectic and thence over to Cherokee Bluff.—*Birmingham, Ala., News.*

Stevens Gravel Co. Makes Improvements

THE plant of the C. W. Stevens Gravel Co. at Indianapolis was closed on October 22 for a period of 15 days, and during that time several improvements and additions were started.

A new 75-hp. hoisting engine was installed which will increase the capacity of the plant. According to Mr. Stevens, this addition will make the daily production approximately 400 cu. yd. of sand and gravel, or more than 1,000,000 lb. of material each day.

The equipment used in the plant includes a steel mast, 78 ft. high. A garage for four trucks with an office adjoining, a cement block plant and a house used as a residence by G. E. Stevens, manager of the plant, are among the buildings on the ground.

The Stevens company produces four grades of sand and gravel. They are street gravel, building gravel, torpedo sand and brick sand. The plant of the company was started in 1919 and began operations a year later. Prior to the organization of this company Mr. Stevens was the owner of the Capitol City Gravel Co.

Shearer Bucket Patent Held Valid

IN the Federal Court in Indianapolis recently in a suit brought by Jesse A. Shearer of Indianapolis against Charles F. Christner of Goshen, Ind., for infringement on patent rights involving gravel dredging apparatus, Judge Anderson held the Shearer patent valid and infringed, and Christner was permanently enjoined from further use or manufacture of the device. The courtroom had the appearance of a machine shop, or a toy shop, from the number of models and drawings that were offered in evidence. The case was vigorously contested. The evidence showed the device complained of in the suit was furnished to Christner by the Page Engineering Co. of Chicago through the Godfrey Conveyor Co. of Elkhart, Ind. The patent in suit had previously been broadly sustained by a number of courts in various parts of the country, and has been held to cover broadly any device of the kind in which the dumping of the bucket is accomplished by the same pull that is used to fill the bucket.

Conkey Company to Open New Gravel Pit

DEEDS were being made out recently for the transfer of grounds in North Aurora, to H. D. Conkey & Co., of Mendota, who plan to open a gravel pit there, the machinery for which will cost $75,000. This company owns several gravel pits, but the business given the H. D. Conkey Co. this year was more than their production and hence has made it necessary to increase their product.—*Mendota, Ill., Reporter.*

Citizens Dispute Use of Lake Water by Sand and Gravel Company

BITTER LAKE, a small body of water north of the city limits, is being lowered rapidly by the use of its waters by the Pioneer Sand and Gravel Co., according to a complaint filed in Superior Court recently in which 14 residents of the territory near the lake ask an order restraining the company from using the waters of the lake.

Judge Mitchell Gilliam signed an order requiring the company to show cause, the morning of October 17, why it should not be restrained from using the lake for sluicing purposes.

Plaintiffs are E. H. Jackson, R. C. Bird, W. Drexel, R. B. Wagner, R. E. Kingsbury, Bert Johnston, W. E. Shields, Leslie Sullivan, F. H. Swift, E. H. Robey, E. E. Smith, J. Doherty, F. D. Walker and a Mr. Birkel. —*Seattle, Wash., Times.*

Gravel Company Sued for Damages From Water

A CIVIL case involving damages estimated at $2500 was due this morning to be launched in Vigo Superior Court. It was venued there from Vermillion county, the plaintiff being J. A. Strain and the defendant being the Standard Sand and Gravel Co. of Clinton.

Mr. Strain claims water was dumped upon 30 acres of his ground, as the sand and gravel company used water in washing its gravel next to his place north of the city.

The case has been in court before and one injunction suit has been disposed of.—*Clinton, Ind., Clintonian.*

Making Survey of Greenville Gravel Company

MR. H. R. EVANS, Mr. E. N. Boothe and Mrs. Harrison Smith, from the Sanderson & Porter Co. of New York, are in Greenville engaged in making a careful industrial survey of not only the Greenville Gravel Co. but all of its subsidiary companies.

This is being done preparatory to a consolidation of the Greenville Gravel Co. to effect this consolidation before January 1. The new consolidation will either continue to be known as the Greenville Gravel Co. or possibly the Greenville Gravel Corp.—*Greenville, Ohio, Advocate.*

Rates Complained Of

ESTABLISHMENT of just and reasonable rates on gravel, in carloads, from Myrtlewood to Linden, Ala., by the L. & N. Railroad Co., is requested in a complaint filed by Saulsbury & Co., with the Alabama Public Service Commission. The complaint will be given formal hearing by the commission.—*Birmingham, Ala., News.*

Questions and Answers

No. 98. **Concrete Railroad Ties**—In a recent issue you had a reference to concrete railroad ties. I would like further information as to their manufacture and use.—S. W. S.

A. Your letter was referred to the Portland Cement Association and the following answer was received, signed by D. A. Tomlinson, manager railways bureau: "I am sending you a copy of our 'Notes on Reinforced Concrete Railroad Ties.' This bulletin has been prepared to give a general idea of the situation on this subject as it now stands. It is not very complete nor up-to-date, as several developments have occurred since it was published. Several tests of considerable magnitude have been started within the last year and we have learned of others which have been going on for some time. Among the more interesting tests is one on the D. T. & I. R. R. About 24 ties were placed during the last fall and winter and it is reported that that road is considering the installation of approximately a mile of similar ties. The American Concrete Tie Corp. at Portsmouth, Va., have had several of their ties in the tracks of the Norfolk & Portsmouth Belt Line for about five years. These ties have been showing up remarkably well.

"William Darst, manager of the American Concrete Tie Corp., would be quite glad to give you data regarding his tie. If you desire to make an extensive study of the subject I would refer you to the reports of the tie committee of the American Railway Engineering Association. This committee has made reports on concrete tie tests for a good many years. You can doubtless find a copy of the Association's Proceedings in some public library near you."

No. 99. **Pulverized Limestone**—Have you any information available regarding a limestone ground to a fineness of practically 100 per cent through a 200-mesh screen and about 97 per cent through a 300-mesh screen?—R. H. S.

A. The present market price of pulverized limestone of between 200- and 300-mesh is in the neighborhood of $5 to $6 per ton in paper sacks. Your material is finer than the average and should be worth more than this, which represents its approximate value for agricultural purposes. For particular uses, where the color is very white, material of this character often sells for $10 to $15 per ton in bags. It has a considerable market as a "mineral filler" in paints, rubber, linoleum, asphalt and products of a similar nature.—N. C. R.

No. 100. **Mixed Mortar Process**—Can you give me any information about the wet-mortar process under the Hay patents? We understand it is in competition with portland cement, and that it will open up a big field for ground limestone.—R. W. R.

A. The Hay process of making mixed lime motor was described in detail in the April 9, 1921, issue of Rock Products. It is largely a machine operation, and produces a superior grade of mortar to that mixed up on the job. The principal features of the patented process are the aeration of the milk of lime hydrate, the curing of the lime paste and the thorough mechanical mixing of the lime paste and sand. We would not say that the wet-mortar process was in competition with portland cement, since it is a lime mortar, and each has its distinctive field. Most ready-mixed lime mortar is used in plastering. Ground limestone, if of the right consistency, can be used in place of sand in any mortar mix. Full details in regard to the Hay mixed mortar process can be obtained from Wm. C. Hay, president of the Blue Diamond Materials Co., Los Angeles, Calif., or from A. P. McCallie, Eastern representative, 5032 Grand Central Terminal, New York City.—N. C. R.

No. 101. **Uses for Colored Talc**—Can you give us an idea as to who would probably be interested in a deposit of green and white talc?—J. T. N.

A. This deposit is in Georgia and the editors will be glad to put interested parties in touch with the owner. Ground or pulverized talc is used as a mineral filler in the manufacture of paper, rubber, etc., for toilet and foot powders, as an extender in paint, for foundry facings and with other products such as roofing paper to prevent sticking. In the massive or bulk form—as soapstone it has many uses familiar to everyone.—N. C. R.

No. 102. **Talc Soapstone and Cryolite**—I would like some information as to the uses of talc, soapstone and cryolite and the market for the same.—W. E. T.

In regard to the ses of talc and soapstone, I would suggest that you send to the U. S. Geological Survey for their bulletin on talc and soapstone, "Mineral Resources of the United States, 1922." This will give you a great deal of information in regard to the localities in which talc is at present produced; the uses to which talc is put, and the prices up to and including the year 1922.

In regard to cryolite. According to the U. S. Geological Survey's bulletin on flourite and cryolite, "Mineral Resources of the United States, 1922," practically no cryolite is produced in this country. In the neighborhood of three or four thousand tons per year are imported from Greenland. Apparently, the only importer in this country is the Pennsylvania Salt Manufacturing Co., Philadelphia, Pa. Cryolite is used in the production of linoleum and in the manufacture of opaque white glass; in enameling white ware, and is a flux in the manufacture of white cement.

Both of the above bulletins you can obtain, free of charge, by dropping a line to the Director of U. S. Geological Survey, Washington, D. C.

In regard to chalk and its uses. I think that your question is quite fully answered in the article on page 36 of the November 3 issue of Rock Products, describing the operations of the Krippendorf-Tuttle White Cliffs Products Co., White Cliffs, Ark.—H. C. R.

No. 103. **Hydraulic Lime**—I have seen references in books to hydraulic lime. I wish you would advise me if it is a regular commercial product in the United States and if so, where it can be obtained.

You will find the best description of hydraulic lime and the method of burning and using it in a book called "Hydraulic Limes and Cement," by Q. A. Gilmore, published about 1868 by D. Van Nostrand Co. This book went through several editions and I think you will find it in nearly all libraries.

At the present time the manufacture of hydraulic lime in this country is practically abandoned. There are three or four hydraulic limes on the market under various names, such as "Brixment," made by the Louisville Cement Co.; Carney's cement, made by Carney's Cement Co., Mankato, Minn., and the Utica cement, made by the Utica Cement Co., Utica, Ill. The Louisville product is a real hydraulic lime, while the other two, I think, are more nearly natural cements.

The distinction between the two, as you probably know, is that a hydraulic lime is one which contains enough lime to hydrate when water is applied to it. The natural cements have to be ground the same as portland cement.

There are a large number of silicious limestones in the United States from which hydraulic lime might be made and there is a possibility that the industry will be resurrected in the next few years, as for certain purposes a good hydraulic lime is undoubtedly better than either natural cement or portland cement.—N. C. R.

Quarried from Life

By Liman Sandrock

A Chat with Fred Murphy

WHILE Fred Murphy and I were sitting over (not literally, you know) our Coca Cola the other noon and discussing what we'd do with a million dollars if we had them—and if we'd put them in the stone business—it occurred to me that Fred was a bully subject for this Quarried from Life page. So I got my Machiavellian mind hitting on all cylinders, and by adroit questioning, by later inquiries among his close friends and by poring over the back files of ROCK PRODUCTS, I got the gist of what is offered you here:

Some of our good mothers of the last generation, much as they personally liked the name, were tempted to dodge "Fred"; they were averse to hear their darlings called "Freddy"! Say, after even a casual look at our subject's portrait, would you take a chance of calling Big Murph Freddy—except over the telephone?

Well, he's been Fred ever since he was born, up in Hamilton, Ontario, in 1882, and sometimes Big Murph, for good measure. He got the usual schooling as a youngster, and later acquired the higher learning at Hamilton Collegiate Institute. Here he was among the elect at his favorite sports—football, baseball, and the manly art of self-defense. Since then he has added golf to his list of accomplishments; it's a sure way of increasing one's vocabulary.

I need no remind the brothers of the crushed stone industry that Fred Murphy can sing—and extraordinarily well, for we heard him at the banquet of the National Crushed Stone Association in Chicago last January. Of course, Charlichaplin—this spelling is doubtless wrong—the well-known first baseman of the Chicago Opera team, may shade Fred a trifle, but Charli has had the advantage of dramatic atmosphere, has done more practicing, and he eats caviar; he's a Russian. Fred isn't!

In fact, in the early days his talent as a singer gained him membership in his home town's famous amateur organization, the Hamilton Operatic Society. During its successful tours in Canada for about five seasons he took leading roles in such popular operas as the Geisha and San Toy; he was one of the two thieves in Erminie, and he also sang one of the principal roles in Floradora. We'd say that this is some repertoire for a young basso! Here is an instance where an embryo stone man made more than just good, whereas we've heard many's the wooden man in opera who was not ace high to a ukulele!

And what else did he do? says you. Well, he came to Chicago in 1914. The first big thing he did was to pave the way to citizenship in God's country; the second was to join the Brownell Improvement Company's organization, in 1916, as a salesman. In

Fred C. Murphy, general sales manager of the Brownell Improvement Co.

1919 Fred was promoted to be the secretary of the company.

Now, the guiders of the destinies of stone companies do not elevate a salesman to higher positions unless the said salesman pretty thoroughly demonstrates his fitness for the job at issue. So along in July of 1922, quoting from ROCK PRODUCTS of that date, we learn that "Fred C. Murphy has been elevated to the position of general sales manager of the Brownell Improvement Company of Chicago." And that's his job today. We also know some of the big things his company is accomplishing which we would like to tell you but they are more or less trade secrets.

Besides attending all of the Illinois state lettings at Springfield, as an alert general sales manager should do, he is also president of the Illinois Transportation Association.

Fred also finds time to attend his Elks' meetings; he is a charter member of the new Lake Shore A. A. Club, and frequently goes to hear a good opera during the season.

"But what are you jotting down in that notebook, Liman?" asks Fred.

"I'm trying to work out a scheme for investing our million dollars—when we get it," says I.

"Yeah?" says Fred; "you reporters are always under suspicion when you trot out your deadly notebook. Let's go. I must get back to the office. Besides, this Coca Cola stuff isn't what it used to be."

They Said It

PRESIDENT JOHN SOURS, who has already passed his seventieth milestone, is still in active charge of operation of the Springfield-Pekin Gravel Co.'s plant. Lime is said to be an enemy of the deadly T. B., but think of all the dire things gravel has held off from John Sours!

IF THE CONTENTION of the chief engineer of the Ontario department of public works is correct—that good roads effect a saving of $115 a year in automobile depreciation alone, we're for them—just as soon as we get a car.

ONCE IN A GREAT WHILE we know of a sand and gravel plant slipping, but according to the *Memphis Press*, one of them slid—into the ol' Mississipp'.

IT'S GOOD NEWS TO learn that the National Sand and Gravel Association Bulletin is self-supporting. It deserves that envious position, and we bet that Secretary—and Editor—Barrows is getting his due share of the credit for this happy condition.

DO WE have to thank Frank Gilbreth for the introduction of the word "superstandardization"? He says it aims consciously at the ideal of the One Best Way. May be, but technical journals are already crowded for space, and it's pretty darn room-compelling.

IT IS SAID that the importations of Swedish, English and German cement recently landed on the Pacific coast will not pass the American specifications. This takes away any possible worry on the part of our American cement-makers.

OL' DOC BUNDESON, who prescribes for the Chicago health department, asseverates that "the rough spots on your language" may have been provoked by your hard luck at golf—he calls it golfitis. He never had his pet crusher go out of commission on a busy day.

Son's Grammatical Error

"GEE, Ma," said the young hopeful when the two looked down into the quarry, "ain't it a heluva deep pit!"

And then Ma smote him where he had been sitting. "Now, will you be good? Never let me hear you say 'ain't' again!"

Editorial Comment

The Matter of Depreciation

To judge from the number of inquiries about it, probably the topic which will be discussed with the greatest interest at the coming crushed stone and sand and gravel conventions will be that of depreciation. This has been brought to the front by the necessity of making income tax returns, but it has a deeper interest to the industries than the mere matter of how much should be allowed in computing taxes. It is an important factor in the cost of production, and a factor that is too often overlooked. Modern industry is getting to a point where expansion and the necessity of bringing the plant up to date have a habit of absorbing the profits about as fast as they are made. If the rejuvenating and modernization of the plant are not allowed for in the cost of production the operator may wake up some morning to find that he must part with all that he has made and a considerable sum in addition, in order to put his plant in shape to meet competition, or he must go out of business.

What Is "Obsolescence?"

We have had many terms to describe the loss of value in machinery and equipment and now a new one is coming to the front. This term is obsolescence, by which is meant that a piece of equipment has not been worn out by use or depreciated by the action of the weather but that, by the introduction of newer and better equipment and by the development of the art in which it is applied it has become obsolete. To take an example from an outside industry, a big copper company destroyed a plant costing two million dollars because the introduction of the flotation process, which came after the plant had been in operation for less than a year, rendered the plant quite obsolete. Obsolescence was formerly not allowed for in making tax returns but it is now.

Ready Mixed Mortars

Ready mixed plaster and concrete form another topic that is sure to arouse the keenest interest at both conventions. Ready mixed mortar has proved itself in a number of cities both east and west. Although it is still opposed in some quarters, the conviction is gaining ground that the system is in line with modern ideas of production and distribution. There is no doubt but that the ready mixed mortar can be made a better and more uniform product, whether such result is actually achieved in practice or not, and its delivery causes less obstruction to the street and has other advantages for the builder. Aggregate and lime producers are interested because in many cases the mortar business might fit in well with their present operation and in every case it will have an influence on the market for their production. Ready mixed concrete is newer than ready mixed mortar, but it would seem to have an application in places where there are a large number of comparatively small jobs in a limited area. There would certainly be an advantage to the contractor in not having to go to the expense of moving his mixer and equipment, and, as in the case of mixed mortar, he could be insured of a uniform product.

A British Idea of Limestone

Europeans are ahead of us in some respects, in the rock products industries, and in others they are far behind. Continental Europe has apparently some things that it can teach us in the application of cement and concrete, but Great Britain, at least, has a lot to learn from us regarding aggregates. This was shown quite conclusively by a letter which came to Rock Products last week from a British reader who wanted some arguments to help him to sell his crushed limestone for concrete aggregate. He said that British engineers had the idea that limestone aggregate was less fire and water-proof and that it could not make so strong a concrete because it was not silicious. He was referred not only to the thousands of examples of the best kind of concrete which have been made from limestone aggregate in this country but to papers which have been published in Rock Products from governmental and other authoritative sources, which show that the fire-resisting power of limestone concrete is greater than that made with any other aggregate. It seems strange that a prejudice against limestone aggregate could have persisted in the minds of British engineers who must have known that it is actually preferred in this country, for certain classes of work, and that this preference is founded on long and ample experience.

Six Cents a Ton Profit

Crushed stone producers who find the margin between cost and selling price growing narrower may draw a little cold comfort from the fact that they are not so badly off as some other people. The Alaska Juneau, the last of the great Alaska gold mines, mined, crushed and treated 198,000 tons of rock in November for a profit of 6 cents a ton. And only excellent management and very economical operation permitted even that small profit. This is only another illustration of the advantages which the rock products industries have over metal mining. The latter industry requires an immense capital outlay and yet the profits are small.

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert,
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning November 12:

Central Freight Association

7366. Sand and gravel, East New Castle, West Pittsburgh, Portersville, Rose Point, Greenville and Henlein, Pa., to Pennsylvania.

To	Per Net Ton— Present	Proposed
Pecan, Pa.	$3.10	$1.25
Shippenville, Pa.	3.10	1.60
Electra, Pa.	3.10	1.60
Reidsburg, Pa.	3.10	1.60
Sutton, Pa.	3.10	1.60

7387. Lime, Durbin, Ohio, to Xenia, Ohio. Present, 6½ cents; proposed, 7 cents.

7389. Sand, Rupel, Ind., to Mishawaka, Ind. Present, 69 cents per net ton; proposed, 60 cents per net ton.

7392. Crushed stone, New Paris, Ohio, to Hillsboro, Ohio. Present, $1.40 per net ton; proposed, $1.20 per net ton.

7393. Gravel and sand, lake, river and bank, other than sand loam, Michigan City, Ind., to Harvard, Ill., Janesville and Madison, Wis. (Rates in cents per net ton.)

To	Present	Proposed
Harvard, Ill.	$1.23	$1.39
Janesville, Wis.	1.33	1.39
Madison, Wis.	1.33	1.39*

*Not applicable via I. C. R. R.

7394. Sand and gravel, Merom and Riverton, Ind., and Palestine, Ill., to stations on C. I. & L. Ry. (Per net ton.)

To C. I. & L. Ry.	Present	Proposed
Jordan, Ind.	6th Cl.	$1.07
Cataract, Ind.	6th Cl.	1.12
Patricksburg, Ind.	$1.26	1.07
Stewarts, Ind.	1.26	1.02
Clay City, Ind.	1.26	1.02
Howesville, Ind.	1.26	.92
Midland, Ind.	1.26	.92
Latta Jct., Ind.	1.26	.92
Gilmore, Ind.	6th Cl.	.92
Lattas Creek, Ind.	1.26	.92
Vicksburg, Ind.	1.26	.92
Rainbow, Ind.	6th Cl.	.92
Rose Hill, Ind.	1.26	.92
Andromeda, Ind.	1.26	.92
Little Giant, Ind.	1.26	.92

Proposed minimum weight—capacity of car.

7395. Slag, coal ashes and coal cinders, Pittsburgh, Pa., to stations on West Side Belt and Pittsburgh and West Virginia railroads. Present, 6th class ranging from 11½ cents to 16½ cents; proposed, to W. S. B. railroad stations, per net ton, Large, Pa., to Bruceton, Pa., inc., 70 cents; Benicall, Pa., to Brownsville Road, Pa., 70 cents; Banksville Jct., Pa., to Foleys Siding, Pa., 60 cents; Pittsburgh, West End, Pa., 60 cents. To P. & W. Va. railroad stations, per net ton, Pittsburgh, Pa., 60 cents; Pittsburgh S. S. Team Tracks, Pa., 60 cents; South Carnegie, Pa., to Hickory, Pa., inc., 60 cents; Woodrow, Pa., to Louise, W. Va., inc., 70 cents; Rockdale, W. Va., to Chandler, Ohio, inc., 90 cents; Reed, Ohio, to Hopedale, Ohio, inc., $1.05.

7421. Crushed stone, Lewisburg, Ohio, to South Solon, Ohio. Present, 6th class; proposed, $1.00 per net ton.

7416. Gravel and sand, except blast, engine, foundry, glass molding or silica sand, Jamestown, Pa., to Hubbard, Youngstown and Doughton, Ohio. Present, $1.05 per net ton; proposed, 90 cents.

New England Freight Association

54 Lime, agricultural, from Bethel, Brookfield, Canaan, Danburg, East Canaan, Conn., Great Barrington, Lee, Mass., and Long Hill, Con to Addison, Baton, Big Flatts, Campville, Chemung, Deposit, Endicott, Hornell, Kirkwood, O go, Tioga Centre, Union, Waverley, Wellsv N. Y., and Great Bend, Pa., 17½. Reason: To permit movement and meet demands of shippers.

5417. Lime, agricultural, from stations on N. Y. N. H. & H. railroad stations in Item 5416 and also New Milford, Redding, Sheffield, Conn., W. Stockbridge, Mass., to various points in New York and Pennsylvania on the D. L. & W., D. & H. Co., L. V. railroad, and N. Y. O. & W. railway, 17½. Reason: To permit movement and meet demand of shippers.

5449. Sand, blasting, core, fire and sea, New Haven, Conn., to Armory, Mass., 9½. Reason: Demands of shippers.

5458. Sand, core, minimum weight 90 per cent of marked capacity of car; except when car is loaded to cubical or visible capacity, actual weight will apply. West Groton, Mass., to Bristol, Meriden, New Britain, Waterbury, Waterbury (Dubin street), Conn., 16½; Torrington, Conn., 18; Norwood, Whitins, Mass., 10 in lieu of Item 297 of B. & M. railroad, I. C. C. A2455. Reason: To properly describe the traffic originating at West Groton, Mass., and permit movement of traffic.

5472. Cement, common, hydraulic, natural or portland, Hudson Upper, N. Y., to C. N. Y. S. railroad stations shown in B. & A. railroad, I. C. C. 8756, 15½. Reason: To restore relationship.

5485. Cement, common, hydraulic, natural or portland, Hudson Upper, N. Y., to Lehigh Valley railroad stations shown in B. & A. railroad, I. C. C. 8747, 15½. Reason: To restore relationship.

Illinois Freight Association

2067B. Crushed stone, C. L., minimum weight capacity of car, $1.13 per net ton from Lehigh and Kankakee and $1.26 from Thornton, Ill., to Rochester, Breckenridge, Edinburg, Taylorville, Owenaco and Millersville, Ill. (M. R. P. 260).

2068A. Stone, sand and gravel, C. L., minimum weight capacity of car, 88 cents per net ton from Joliet, Ill., to Gilman, La Hogue, Piper City, Chatsworth, Secor, Rueka, Cruger, Washington, Farmdale and East Peoria, Ill. (M. R. P. 264).

2166. Crushed stone, C. L., minimum weight capacity of car, $1.01 per net ton from Lehigh and Kankakee, Ill., and $1.14 from Thornton, Ill., to Hendrix, Randolph, Keyworth, Earls, Bucks, Carle, Springs, Wapella, Ducey, Snells and Clinton, Ill., via Bloomington, Ill. (M. R. P. 257).

2172. Crushed stone, C. L., minimum weight capacity of car, $1.21 per net ton from Lehigh and Kankakee, Ill., and $1.34 from Thornton, Ill., to Canton, Ill., via Gilman or Chatsworth, Ill., and T. P. & W railway.

Southern Freight Association

11633. Clay or kaolin, C. L., minimum weight 50,000 lb., from Cartersville, Ga., to Eastern points shown below. Class A rates now apply. Proposed rates: To Canton Junction, Chicopee Falls, Andover, Hanover and North Brookfield, Mass., $7.92, same as to Boston, Mass.; to Stockton, N. J., $6.01; same as to Phillipsburg, N. J., and to Sommerville, N. J., $5.99 per net ton, made by using proportional rate of $3.49 to Potomac Yard, plus $2.50 beyond.

11634. Clay or kaolin, C. L., minimum weight 50,000 lb., from Cartersville, Ga., to Eastern Port Cities, via rail and water. It is proposed to reduce the present rates to be the same as in effect from McIntyre, Ga., the proposed rates being: To Boston, Mass., $5.53; New York, N. Y., Philadelphia, Pa., and Baltimore, Md., $4.93 per net ton.

11635. Cement, C. L., from Fordwick, Va., to stations on the C. & W. C. railway, between Augusta, Ga., and Beaufort, S. C., not including Augusta or Beaufort, and stations on the A. C. L. railroad between Charleston and Yemassee, not including Sumter. Present, 26 cents; proposed, 24 cents per 100 lb., made in line with present rates from Birmingham, Ala.

11637. Cement, C. L., from Birmingham, Boyles, North Birmingham and Leeds, Ala., to Tennessee Central railroad stations east of Nashville, Tenn. It is proposed to reduce present rates to be the same as cement combination rates from Ragland, Ala.

11638. Sand and gravel, C. L., from Prattville Junction and Jackson's Lake, Ala., to Graveville, Fla. Present rate, 17 cents per 100 lb. (Class N subject to Agt. Speinden's 75 cents). Proposed, 7 cents per 100 lb., made in line with rates to and from other points in the same general territory, distance considered.

11647. Slag, C. L., from Birmingham, Ala., and Group to Georgia points named below. Class A rates now apply. It is proposed to establish the following rates: To Waycross, Waresboro, Hasty, Fairfax, Millwood, Ruskin, Glenmore, Bonnyman and Blackshear, Ga., $1.94; Manor, Argyle, Owens, Patterson and Offerman, Ga., $1.98 per net ton. Proposed rates based on the proposed Georgia-Alabama mileage scale, less 10 per cent.

11652. Cement, carloads, from Birmingham, Ala., to stations on the Miss. So. railroad. Combination on Lumberton, Miss., now applied. Proposed rate, 22 cents per 100 lb., same as rate to parallel stations on the G. & S. I. railroad.

11660. Cement, C. L., from Nashville to Bemis, Tenn. Present, 16 cents; proposed, 15 cents per 100 lb., same as in effect to Jackson, Tenn.

11662. Slag, C. L., from Birmingham, Ala., and Group to S. A. L. railway stations named below. Present and proposed rates are in cents per 2000 lb.:

To	Present	Proposed
Leslie, Ga.	196	176
Huntington, Ga.	205.8	176
Gatewood, Ga.	205.8	176
New Point, Ga.	205.8	167
Plains, Ga.	192	167

Proposed rates made on basis of the proposed Georgia scale.

11674. Clay, crude or ground (not earth or metallic paints), C. L., minimum weight 50,000 lb., from Fort Payne, Ala., to Cincinnati, Ohio. Present rate, $4.05 per net ton, subject to minimum weight of 40,000 lb., as to 68 cents of the rate to Chattanooga, Tenn., and 50,000 lb., as to the remainder. Proposed rate, $3.42 per net ton, same as the proposed Alabama scale for distance of 389 miles (joint line scale).

11689. Slag, C. L., minimum weight marked capacity of car, from Opelika, Ala., to Auburn, Ala. Present, $2.60; proposed, 80 cents per net ton, same as rate on gravel, C. L., and crushed stone, C. L., from Opelika, Ala. to Auburn, Ala.

11709. Gravel, C. L., minimum weight marked capacity of car, from Demopolis, Ala., to Lisman, Ala. Present, $1.67; proposed, $1.13 per net ton, based on scale proposed by carriers to the Alabama Public Service Commission for joint haul, less 10 per cent.

Southwestern Freight Bureau

9912. Cement plaster. To establish rate of 20½ cents per 100 lb. on cement plaster, C. L., minimum weight 60,000 lb., from Acme and Agatite, Texas, to the following Missouri stations on the Wabash railway: Dalton to Keytesville, Incl., Salisbury, Clifton, Huntsville, Moberly, Hannibal. Remarks: The purpose of this docket is to publish in connection with the Wabash railway the same rate on cement plaster as is published in connection with the C. B. & Q. railroad.

9922. Cement. To establish the following rates in cents per 100 lb. on cement, C. L., minimum weight 50,000 lb., from Portland and Concrete, Colo., to points on the C. R. I. & P. railway in Oklahoma, Tyrone to Texhoma, incl., as follows:

Tyrone, Okla.	26½
Hooker, Okla.	28½
Optima, Okla.	30½
Guymon, Okla.	32½
Goodwell, Okla.	34½

Remarks: Shippers claim the proposed rates merely represent what is considered a consistent grade to these C. R. I. & P. railway points between Liberal, Kan., and Texhoma, Texas.

9927. Cement. To restore on cement, C. L., from Hartshorne, Okla., to stations on the La. & Ark. railway in Arkansas and Louisiana, the differentials under Kansas Gas Belt existing on June 24, 1918, as increased under Ex Parte 74 and reduced under I. C. C. Order 13293, subject to rule governing disposition of fractions. Remarks: It is claimed that since this action has been taken in connection with rates from Ada, Okla., the same action should be taken with respect to rates from Hartshorne in order to keep these points on a parity.

9951. Cement plaster. To establish rate of 28½ cents per 100 lb. on cement plaster, C. L., and articles taking same rates, from Plasterco Jct., Texas, to stations on the C. & E. I. railroad in Indiana, Pimento to Evansville, inclusive, and Ft. Branch to Mt. Vernon, incl. Remarks: Owners of the plant recently established at Plasterco Jct. are desirous of enlarging territory to which their product may be shipped and advise that there is

a demand for their produce in the territory referred to.

9962. Sand and gravel. To establish rates on sand and gravel, C. L., minimum weight marked capacity of car, from Arkansas City and Silverdale, Kan. to stations on the M. V. railroad in Oklahoma, based on the 9702 scale. Remarks: The sand and gravel shippers of Arkansas City and Silverdale, Kan. have requested that they be permitted to enter Oklahoma on basis of the 9702 scale.

9968. Crushed stone, magnesium chloride, etc. To amend Item 1946 of Trf. 44M, applying on crushed stone, magnesium chloride, etc., mixed C. L., from Kansas City, Mo. etc., to points in Oklahoma, by adding the following: "Crushed stone in bags, magnesium chloride, not exceeding 20 per cent of the total weight of stucco may be included in shipments containing stucco at the stucco rate and minimum weight." Remarks: Request is received from Oklahoma dealers to provide for the inclusion of crushed stone and magnesium chloride in mixed cars of building materials as provided for in Item 1946, these being materials that are used for construction purposes the same as are those now mentioned in the item.

9973. Stone, gravel, etc. To make the distance commodity rates on stone, gravel, etc., published in Item 4104 of S. W. L. Trf. 26X, from Oklahoma points to Texas points, apply northbound. Remarks: These shippers at Lueders, Texas, state that the present rates are too high and that if given the same rates northbound as are now applicable southbound, they could ship their products into Oklahoma.

9976. Lime. To establish on lime, C. L., minimum weight 50,000 lb., from Mincke, Mo., to points in Oklahoma, rates on basis of 3½ cents per 100 lb. higher than rates published in the St. L. S. F. Trf. 69K from Ash Grove-Springfield district, northbound. Remarks: The basis suggested is that which applies on lime from the Ash Grove-Springfield district north bound to Chicago, etc., over the rates published from Mincke.

9982. Crushed stone in bags, magnesium chloride, etc. To amend paragraph B, Item 306A, Sup. 8, S. W. L. Trf. 55-series, applying on gypsum, plaster, etc., between points in Oklahoma to include the following: "Crushed stone in bags, magnesium chloride, not to exceed 20 per cent of the total weight of stucco may be included in shipments containing stucco at the stucco rate and minimum weight." Remarks: Request has been received from Oklahoma dealers to permit crushed stone and magnesium chloride to be included in mixed shipments with stucco and other building materials as provided in Item 306 of Trf. 55G at the rates applying on stucco.

9985. Cement. To establish rate of 26 cents per 100 lb. on cement, C. L., minimum weight 50,000 lb., from Ada, Okla., to Augusta, Ark. Remarks: Shippers contend that the present rate is too high and should not be in excess of 26 cents.

9999. (Emergency) Sand. To establish a rate of 23 cents per 100 lb. on sand (except asbestos sand) minimum weight 50,000 lb., or marked capacity of car if less than 50,000 lb., from Guion, Ark., to Laredo, Texas, for export to Mexico. Remarks: It is claimed that the present rate of 67½ cents per 100 lb. on sand is prohibitive, and that no traffic will move under it.

10012. (Emergency) Gravel. To establish a rate of 6½ cents per 100 lb. on gravel C. L., minimum weight marked capacity of car from Fullerton, La., to Pineland, Texas, and intermediate points. Remarks: It is claimed that the present basis applicable is prohibitive and will not permit movement.

Texas-Louisiana Tariff Bureau

5666-TX. Fire clay, rates on, between points in Texas. Proposition from shippers to amend Item 1430, Texas Lines tariff 2H, to permit fire clay not to exceed 1000 lb. in weight to be shipped in mixed carloads with any of the preceding articles shown in item. Shippers state when shipping flues, which when complete comprise firebrick, flue lining and chimney tops, require several hundred pounds of fire clay for mortar, and in order to avoid shipping in small quantities they request to be permitted to ship fire clay not to exceed 1000 lb. in weight with any of the articles in Item 1430 Texas Tariff 2-H.

5680-TX. Cement, C. L., minimum weight on between points in Texas and between Group A points and points in Texas. Proposition from carriers to increase minimum weight on cement, C. L., to 50,000 lb., where now lower, not to affect minimas where now higher, on traffic between points in Texas and between Group A points and Texas points.

Proposed minimum weight has been established on traffic between points in Southwestern Freight Bureau territory, where now less. It is stated that this increase is justified not only by the competitive situation on interstate traffic but also by the general effort to increase car loading in the interest of car efficiency.

Western Trunk Line

3438. Lime, bulk, C. L., from Mincke, Mo., to Hutchinson, Kan., and intermediate points. Present, 30½ cents per cwt., minimum weight 30,000 lb. Proposed, 24½ cents per cwt., minimum weight 60,000 lb.

1642A. Lime, C. L., from Mitchell, Ind., Bedford, Ind., Salem, Ind., Hannibal, Mo., Quincy, Ill., Marbelhead, Ill., and Menominee, Mich., to Tomahawk and Wisconsin Dam, Wis.

Present— From	Cents Per 100 lb.
Mitchell, Ind.	27
Bedford, Ind.	27
Salem, Ind.	27
Hannibal, Mo.	29½
Quincy, Ill.	29½
Marblehead, Ill.	29½

Menominee, Mich., 14 cents to Tomahawk, Wis. Menominee, Mich., 23 cents to Wisconsin Dam, Wis. Proposed: From Mitchell, Ind., Bedford, Ind., Salem, Ind., Hannibal, Mo., Quincy, Ill., Marbelhead, Ill., 24 cents per 100 lb. or 2½ cents over Wisconsin Rapids, Wis., rates. Menominee, Mich., 14 cents per 100 lb. to Wisconsin Dam, Wis. which is rate to Tomahawk, Wis. or 2½ cents over Wisconsin Rapids, Wis., rate. Minimum weight, 30,000 lb.

3527. Stone, broken, crushed or ground. C. L., between points in W. T. L. territory. Present description — Various, some items applying on crushed stone; other applying on broken stone, etc. Proposed: Stone, broken, crushed, or ground.

Trunk Line Association

11748. Cement, common, hydraulic, natural or portland, C. L., minimum weight 50,000 lb., except when for carriers' convenience cars of less capacity are furnished, in which case the minimum weight will be the marked capacity of car, furnished, but in no case less than 40,000 lb. From the Lehigh district to Beverly, Mass., 19 cents per 100 lb.

Pacific Coast States Import Silica Sand

THE expansion of the glass industry in the manufacturing centers of the Pacific coast region draws attention to the need for an adequate supply of high-grade silica sand. At present a large proportion of the total amount used comes from European countries, but it is more than probable that, assuming the discovery or utilization of nearby deposits or the discovery of freight rates from inland points, California may become independent of foreign supplies. It is, however, essential that producers should realize the importance of strict standardization of products in regard to uniformity, composition and physical character. This subject has been studied by a committee on standards, Glass Section, appointed by the American Ceramic Society, and tentative specifications have been compiled.—*Chemical and Metallurgical Engineering.*

Slate Industries Convention in New York, January 21-23

THE slate industry is having a good year. Present indications show good business on books but no boom or over production. Sales in dollars and cents for the first nine months of 1923 are ahead of 1922 by 15 to 20 per cent, according to firms reporting to the National Slate Association.

The National Slate Association, as part of its program to assure the public satisfaction in uses of slate, is conducting an exhaustive investigation and research to determine the proper kind of nails to use for applying slate roofs. Architects, engineers, roofers and manufacturers of nails of all kinds are co-operating in this important work. Results of this survey will be made known at slate industry meetings in New York in January.

Quarry and slate mill owners, managers, superintendents, executives, as well as members of the trade, dealers, jobbers, roofing and other slate contractors from all parts of the country, will gather at New York, Hotel Commodore, January 21, 22 and 23, to discuss common problems and bring forth all the progress of the past year for better productions, distribution and utilization of slate and slate products.

Show Britons Cement in Art

LEADERS of the cement manufacturing industry in Great Britain were shown how America has made concrete a material for sculptor's art as well as for building, when ten members of various British cement makers' organizations inspected "The Fountain of Time" in Washington park, accompanied by Lorado Taft, the sculptor, who conceived the group.

The party, which is headed by Percy Malcolm Stewart, chairman of the Cement Makers' Federation and other cement enterprises, has been in Chicago for two days inspecting Chicago's paved streets and the concrete highways of Cook county.

The visitors were particularly impressed with the extensive use of concrete in America for sculptural and decorative purposes. The great strides made by the United States in concrete highway building brought enthusiastic comment from Mr. Stewart. He said, however, that Great Britain's progress in concrete house construction was much ahead of the United States. — *Chicago Tribune.*

Gypsum Tested on California Alfalfa Fields

THAT application of gypsum to the alfalfa soils of northern Butte county will show a large return has been demonstrated by tests upon the F. R. Parker ranch, so H. E. Drobish, county agricultural agent, told the members of the Shasta Farm Center on Monday evening.

Demonstration plots of alfalfa were treated with various substances and the return to the growers checked by untreated plots. These tests showed that gypsum gave the largest increase in returns at the smallest cost.

The tests worked out on an acreage basis gave the following results:

	Cost per acre	Net value of gain per acre
Gypsum	$2.50	$26.15
Super-phosphate	4.50	15.77
Sulphur	6.82	15.23

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.40	1.40	1.30	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	1.25
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.40	1.40	1.30	1.30	.....
Prospect, N. Y.	.80	1.40	1.30	1.25	1.25	.....
Walford, Pa.	1.55	1.55	1.55	1.55	1.55	1.55
Watertown, N. Y.	.50	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.75	1.35	.....	.....
Bloomville, Middlepoint, Dunkirk, Bellevue, Ohio	1.00	1.10	1.10	1.00	1.00	1.00
Cypress, Ill.	1.25	1.35	1.35	1.25	1.20	1.15
Chicago, Ill.	.80	1.40	1.10	1.10	1.10	1.10
Dundas, Ont.	.90	1.35	1.35	1.25	1.10	1.10
Greencastle, Ind.	1.25	1.15	1.05	1.05	1.05	1.05
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.35	1.35	1.20	1.20
Lannon, Wis.	.75	1.00	1.00	.90	.90	.90
Linwood, Iowa	.80	.....	1.35	1.15	1.25	1.25
Mitchell, Ind.	1.00	.....	.....	.....	.....	.....
Montrose, Iowa	.....	1.50	1.60	1.55	1.45	1.40
St. Vincent de Paul, P. Q.	.85	1.20	1.10	1.00	.95	.95
Sheboygan, Wis.	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10
Southern Illinois	1.35	1.35	1.35	1.35	1.35	1.00
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Ia.	.75	.....	1.50†	1.40	1.30	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25‡	2.25‡	2.25‡	2.00	2.00
Waukesha, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bridgeport, Texas	1.10	1.40	1.35	1.35	1.25	1.25
Cartersville, Ga.	.....	1.50	1.50	1.00	1.00	1.00
Chickamauga, Tenn.	1.00@1.25	.85@1.25	.....	.85@1.00	.85@1.00	.....
El Paso, Texas	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.60	1.70	1.70	1.50	1.40	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Graysville, Ga.	1.00@1.25	.85@1.25	.....	.85@1.00	.85@1.00	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Ft. Worth), Tex.	1.10	1.35	1.30	1.25	1.25	1.20
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	1.60‖@2.10
Blue Spr'gs and Wymore, Neb.	.20	1.45	1.45	1.35	1.25	1.20
Cape Girardeau, Mo.	1.35*	1.35*	1.35*	1.35*	1.10*	.....
Kansas City, Mo.	1.00	1.65	1.65	1.65	1.65	1.65

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.35	1.15	1.00	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.40	.....
E. Summit, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50@2.00	1.35@1.50	1.15@1.25	1.00@1.10	.....
Oakland, Calif.	1.75*	1.75*	1.75*	1.75*	1.75*	1.75*
Richmond, Calif.	.50*	.....	1.65*	1.50*	1.50*	.....
San Diego, Calif.	1.80	1.80	1.50@1.80	1.25@1.55	1.25@1.55	1.10@1.35
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	1.75	2.00	2.00	1.80	1.60	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Atlanta, Ga.—Granite	1.47	2.07	2.07	1.97	1.97	.....
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.—Granite	.50	.....	2.00	1.75@2.00	1.75	.....
Eastern Penna.—Sandstone	.85	1.60	1.55	1.35	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.75	1.75	1.25	1.25	.....
Los Angeles, Calif.	2.00	2.00	1.85	1.75	1.65	.....
Middlebrook, Mo.—Granite	3.00@4.50	.....	2.00@3.00	2.00@2.25	.....	1.50@2.20
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yd. †1 in. and less; ‡prices include 90c freight; ‖rip rap, 1.60 per ton.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 4.50

Branchton, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; 100% thru 20 mesh; sacks, 5.00 ..... 3.50

Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, 5.00; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk 2.50

New Castle, Pa.—94% $CaCO_3$, 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk 3.50

Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk 3.00

Watertown, N. Y. — Analysis, 96 to 99% $CaCO_3$; .02% $MgCO_3$; 90% thru 100 mesh; bulk, 3.00; sacks 4.50

West Stockbridge, Rockdale, Mass., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk 3.25

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 100 mesh 6.00
50% thru 4 mesh 4.00

Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Cypress, Ill. — Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 50% thru 100 mesh, 90% thru 50 mesh, 50% thru 50 mesh, 90% thru 4 mesh 1.50

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 80-lb p. sacks 5.00; bulk 3.50

Piqua, Ohio—100% thru 100 mesh; bags, 7.00; bulk 5.50
80% thru 100 mesh; bags, 5.00; bulk 3.50
50% thru 100 mesh; bags, 4.00; bulk ..... 2.10@ 2.25

Waukesha, Wis.—Analysis, neutralizing equivalent 107.38% $CaCO_3$; 99% thru 10 mesh, 55% thru 60 mesh; bulk 2.35
200-mesh bags ex., returnable 4.50

Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk 2.70

Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk 2.70

Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200 lb. burlap bag, 4.00; bulk 2.75

Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks 5.00

Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk 4.00

Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk 4.50

Dundas, Ont. — Analysis, 53.80% $CaCO_3$, 43.31% $MgCO_3$—35% thru 100 mesh; 50% thru 50 mesh; 100% thru 10 mesh; bagged, 4.75; bulk 3.00

Agricultural Limestone

(Crushed)

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh 1.25

Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50
Buffalo, Iowa—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh ..... .80

Columbia, Ill., near East St. Louis—¼-in. down ..... 1.25@ 1.80

Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh 1.25

Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh 1.25

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Agricultural Limestone

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Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.25
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 83% thru 10 mesh; bulk	1.25
Milltown, Indiana.—Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 35% thru 50 mesh	1.40@ 1.65
Montrose, Iowa.—90% thru 100 mesh	1.25
Narlo, Ohio.—Analysis, 56% $CaCO_3$, 43% $MgCO_3$; limestone screenings, 37% thru 100 mesh, 55% thru 50 mesh, 100% thru 4 mesh	1.50@ 2.00
Ohio (different points), 20% thru 100 mesh; bulk	1.25@ 1.50
Piqua, Ohio—100% thru 4 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ½-in. mesh	1.30
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Toledo, Ohio.—¼ in. to dust, 30% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Va. — Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.75
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh, 50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	3.00 2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 100 mesh	1.50
Ladds, Ga. — Analysis, 56% $CaCO_3$, 42% $MgCO_3$—all passing 10 mesh	1.50@ 1.75
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:	
Berkeley Springs, W. Va.	2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.—24 mesh, 5.00; 40 mesh, 6.00; 100 mesh	7.00
Columbus, Ohio	1.50@ 1.75
Dunbar, Pa.—Damp	2.50
Falls Creek, Pa.	2.25
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.00@ 2.50
Mapleton, Pa.	2.25@ 2.50
Mapleton Depot, Pa.	2.50
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Millville, N. J.	2.00
Mineral Ridge, Ohio	2.50
Montoursville, Pa. (green)	2.00
Oregon, Ill.	2.50
Ottawa, Ill.	1.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Ridgway, Pa.	2.50
Rockwood, Mich.	2.50@ 2.75
Round Top, Md.	2.25
Sands, Pa.	2.50
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	2.50@ 3.00
St. Mary's, Pa.	2.25
Thayers, Pa.	2.00@ 2.50
Utica, Ill.	1.25@ 1.50
Zanesville, Ohio	2.00@ 2.50
Foundry Sand:	
Albany, N. Y.—Core	1.60
Molding fine, brass molding	2.50
Molding coarse	2.25
Sand blast	4.00
Allentown, Pa.—Core and molding fine	1.75@ 2.00
Arenzville, Ill.—Molding fine	1.50@ 1.75
Brass molding	1.75
Beach City, Ohio.—Core, washed and screened	2.00@ 2.50
Furnace lining	2.50@ 3.00
Molding fine and coarse	2.25@ 2.50
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00
Cleveland, Ohio.—Molding coarse	1.50@ 2.00
Brass molding	1.50@ 2.00
Molding fine	1.50@ 2.25
Core	1.25@ 1.50

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Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge and So. Hts., Pa.	1.25	1.25	.85	.85	.85	.85
Attica, N. Y.	.75	.75	.75	.75	75	.75
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		.75	.90		1.25	
Farmingdale, N. J.	.48	48	.65		1.10	
Machias, N. Y.	.75	75	.85	.85	.85	
Pittsburgh, Pa.	1.25	1.25	.90	.85	.85	.85
Portland, Me.		.50	1.75		1.35	1.25
Washington, D. C.—Rewashed, river	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Anson, Wis.	.35@ .40	.35@ .40				.80@ .85
Barton, Wis.		.40@ .60		.50@ .70	.50@ .70	
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.75	.75@1.00	.75@1.00	.75
Covington, Ind.	.75	.60	.75	.75	.75	.75
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
			Unwashed ballast, .50 ton			
Attica, Ind.	.75	.60	.75	.75	.75	.75
Moronts, Ill.	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Oregon, Ill.	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Ottawa, Ill.	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ill.	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Dresden, Ohio	**.70**	**.60**			**.90**	
Eau Claire, Wis.	.40@ .50	.40	1.00@1.25			.85
Elkhart Lake, Wis.	.60	.60	.70	.70	.70	.70
Grand Rapids, Mich.		.50		.70		.80
Hamilton, Ohio		**1.00**			**1.00**	
Hersey, Mich.	.50	.50		.75		.75
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.65	.65	1.75	1.70	1.65	1.65
Mankato, Minn.	.40‡	.40				
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Moline, Ill.	.60	.60	Concrete gravel, 40% G., 60% S., .90			
Palestine, Ill.	.75	.60	.75	.75	.75	.75
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65§	1.45	1.65	1.45‖
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Silverwood, Ind.	.75	.60	.75	.75	.75	.75
Summit Grove, Ind.	.75	.60	.75	.75	.75	.75
Terre Haute, Ind.	.75	.60	1.00	1.00	.75	.75
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	.50	.90@1.00	.90@1.00	.90@1.10
			(.05 ton discount 10 days)			
Zanesville, Ohio		.60	.60	.90	.90	
SOUTHERN:						
Birmingham, Ala.	1.29	1.29	2.79	1.79	1.64	1.54
Brookhaven, Miss.; Roseland, La.	.50@ .75	.25@ .50	1.00@1.50	1.00@1.25	.85@1.00	.85@1.00
Charleston, W. Va.	all sand 1.40 f.o.b. cars		all gravel 1.50 f.o.b. cars			
Estill Springs, Tenn.	1.35	1.35		1.00	.85	.65
Ft. Worth, Texas	2.25	2.25	2.25	2.25	2.25	2.25
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	1.00	1.20	1.20	1.20	
Lake Weir, Fla.		.50				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
New Martinsville, W. Va.	1.00	1.00			1.20	.80
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.		Kaw river sand .75 per ton f.o.b. plants				
Los Angeles, Calif.		.85@1.15	1.65	1.65	1.50	1.50
Pueblo, Colo.	1.10*	.90*			1.50*	
San Diego, Calif.†	.50@ .70	.80@1.00	1.30@1.60	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash. (bunkers)	1.25*	1.25*	1.50*		1.25*	1.25*
Spring Valley, Calif.	**.70**	**.80**	**1.40**	**1.35**	**1.25**	**1.25**

Bank Run Sand and Gravel

City or shipping point	Fine sand, 1/10 in.	Sand, ¼ in.	Gravel, ½ in.	Gravel, 1 in.	Gravel, 1½ in.	Gravel, 2 in.
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Brookhaven, Miss.; Roseland, La.					.35@ .50	
Cape Girardeau, Mo.			River sand, .80 per yd.			
Cherokee, Iowa			**.80 per ton—1.20 washed**			
Dresden, Ohio					.25	
Dudley, Ky. (crushed sand)	**1.00**	**1.00**		**.90**		
East Hartford, Conn.			**.65 per cu. yd.**			
Elkhart Lake, Wis.	.60	.50				
Estill Springs, Tenn.						**.85**
Fishers, N. Y.		**.60**			**.55@ .60**	
Gainesville, Texas		.95				.55
Grand Rapids, Mich.						.60
Hamilton, Ohio					.70	
Hartford, Conn.		**1.00***				
Hersey, Mich.				.50		
Indianapolis, Ind.			**Mixed gravel for concrete work, .65**			
Lindsay, Texas	.95					.55
Mankato, Minn.			Pit run gravel, .50			
Moline, Ill.	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Pine Bluff, Ark.			**Road gravel .50**			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Saginaw, Mich., f.o.b. cars		**.75**	**1.30**	**1.30**	**1.30**	**1.30**
St. Louis, Mo.						1.55
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Waukesha, Wis.	.60	.60	.60	.60	.60	.60
Winona, Minn.			Washed gravel .50 to .60 a ton			
York, Pa.		.95@1.10	(crushed rock sand)			
Zanesville, Ohio		**.60**	**.60**			

*Cubic yard. †Low prices, wholesale; high prices, retail; ‡¾ inch down; §⅝ inch and less; ‖2¼ inches and less.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.		Crushed run slag, 4 in. and less, 1.25@1.35					
Emporium, Pa.			1.25	1.25		1.25	1.25
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, f.o.b. Chicago				
Detroit, Mich.			All sizes, 1.65, f.o.b. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.25	1.25	1.25	1.25
Steubenville, Lowellville, Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton and Roanoke, Va.	2.50	.60	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50*	10.50*	10.50*	9.00		8.50	1.80
Buffalo, N. Y.				12.00				
Berkeley, R. I.			12.00					2.30
Cassadaga, N. Y.			Agricultural marl 7.00					
Lime Ridge, Pa.							5.00a	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00				6.00	
York, Pa. (dealers' prices)		11.50	11.50	12.50				1.85b
CENTRAL:								
Cold Springs, Ohio	12.50	11.00	10.00		9.00	11.00‖	10.00	
Delaware, Ohio		10.00	9.00	11.00			9.00	1.60
Gibsonburg, Ohio	12.50	11.00	10.00		9.00	11.00	10.00	
Huntington, Ind.	12.50	11.00	10.00		9.00	11.00	10.00	1.60c
Luckey, Ohio	12.50‡	11.00	9.00‡					
Marblehead, Ohio		11.00	10.00				10.00	1.60d
Marion, Ohio		11.00	10.00				10.00	1.80†
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.60
Sheboygan, Wis.							10.00	
Tiffin, Ohio					9.00	11.00		
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50‡	11.00‡	10.00‡				10.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.50
El Paso, Texas							10.00	1.50
Karo, Va.							7.00	1.50
Knoxville, Tenn.	12.50	11.00	11.00	11.00	8.50		8.50	1.50
Ocala and Zuber, Fla.	13.00						11.00	1.70
Sherwood, Tenn.	12.50	11.00	11.00	11.00			8.50	1.50
Staunton, Va.					4.50		8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	15.00
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.40
Tehachapi, Calif.							13.00	2.10e

*Paper sacks; †180-lb. net, non-returnable metal barrel; ‡50-lb. paper bags, terms 30 days net, 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice; ‖ 80-lb. paper bags; (a) F. O. B. kilns; (b) 180 lbs. net; $2.85, 280 lbs. net; (c) wooden bbls.; (d) wooden, 1.60, steel, 180; e, wooden bbls.; steel bbls., 2.20.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio—Core	.40@ 2.00
Molding fine, brass molding	2.00@ 2.50
Furnace lining	1.75@ 2.50
Sand blast	3.50@ 5.50
Stone sawing	1.50@ 2.00
Traction	.50@ .75
Molding coarse	1.75@ 2.00
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dunbar, Pa.—Traction	2.50
Dundee, Ohio.—Glass, core, sand blast traction	**2.50**
Molding fine, brass molding (plus 75c for winter loading)	**2.00**
Molding coarse (plus 75c for winter loading)	**1.75**
Eau Claire, Wis.—Sand blast	3.25@ 3.75
Falls Creek, Pa.—Molding, fine and coarse	**1.75**
Sand blast	**2.00**
Traction	**1.75**
Franklin, Pa.—Core	2.00
Furnace lining	2.50
Molding fine and coarse	2.00
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.30@ 1.60
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled	**.80**
Bank run	**.65**
Kansas City, Mo.—Missouri river core	.80
Kasota, Minn.—Molding fine	1.60@ 1.85
Molding coarse, stone sawing	1.45@ 1.75
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse, stone sawing, roofing sand	2.00
Mapleton Depot, Pa.—Brass molding	2.00
Molding fine	2.00
Roofing sand	2.50
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp, 2.00; dry	**2.75**
Massillon, Ohio—Molding fine, coarse, furnace lining and core	3.00
Traction	2.75
Michigan City, Ind.—Core, traction	.50
Millville, N. J. Core	2.00
Mineral Ridge, Ohio.—Core, furnace lining, molding fine and coarse, roofing sand, sand blast, stone sawing (green)	2.00
Traction (green)	1.85
Montoursville, Pa.—Core	1.25@ 1.40
Furnace lining	1.20
Traction	1.25
New Lexington, Ohio—Molding fine	2.25
Molding coarse	2.00
Oregon, Ill.—Core	1.50@ 2.00
Sand blast	4.00
Stone sawing	2.00@ 2.50
Ottawa, Ill.—Molding, coarse (crude)	.85@ 1.00
Ottawa, Minn.—Crude silica sand	.75@ 1.00
Ridgway, Pa.—Core	2.00
Furnace lining, molding fine, molding coarse	1.25
Traction	2.25

Miscellaneous Sands

(Continued)

Rockwood, Mich.—Core	2.00@ 2.50
Roofing	2.75@ 3.00
Sand blast	3.75
Round Top, Md.—Roofing sand	2.25
Traction	1.75
San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@ 3.50
(Direct from pit)	
Furnace lining, molding coarse, sand blast	**3.50**
Stone sawing, traction	**2.30**
St. Louis, Mo.—Red heavy molding	1.50@ 2.25
Red fine	1.50@ 2.00
Molding fine and brass	2.00@ 3.00
Skein core	1.75@ 2.25
White core sand	1.00@ 1.75
Sand blast	2.00@ 4.50
Furnace lining	1.50@ 2.50
Roofing sand	1.00@ 1.50
Stone sawing	1.25@ 2.00
Thayers, Pa.—Core	2.25
Furnace lining, molding fine and coarse	1.25
Traction	2.25
Utica, Ill.—Core, furnce lining, molding coarse	.75@ 1.50
Molding fine	.75@ 2.25
Roofing sand, traction, brass molding	1.25@ 1.50
Sand blast	2.25
Stone sawing	1.25@ 2.25
Warwick, Ohio—Furnace lining, green	1.75
Core, green, 2.00; dry	2.50
Molding fine, molding coarse, green, 2.00; dry	2.75
Traction	2.75
Brass molding	2.25
Zanesville, Ohio—Molding fine, brass molding	1.75@ 2.00
Molding coarse	1.50

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point

Asheville, N. C.—Best white and 200-mesh (per ton)	8.00
Yellow (per ton)	9.00
Red (per ton)	13.00
Baltimore, Md.—Crude talc (mine run)	3.50
Ground talc (20-50 mesh), bags	**10.00**
Ground talc (150-200 mesh), bags	**12.00**
Cubes	60.00
Blanks (per lb.)	.08
Chatsworth, Ga.—Crude talc (grindings)	5.00
Ground talc (150-200 mesh), bags	8.00@15.00
Pencils and steel workers' crayons, per gross	1.00@ 2.50
Chester, Vt.—Crude talc	3.50@ 4.00
Ground talc (150-200 mesh), bulk	6.50@ 8.50
Including bags	7.50@ 9.50
Emeryville, N. Y.—325 mesh	14.75
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	**18.00**
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton	3.00@ 3.50
Ground (20-50 mesh), bags	6.50@ 8.00
(150-200 mesh), bags	9.75@12.50
Keeler, Calif., bulk	20.00@30.00
Los Angeles, Calif.—Crude	15.00@22.00
Marshall, N. C.—Crude talc, bags	6.00
Ground talc (150-200 mesh); bags	8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	**12.00@13.00**
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	**8.50@10.00**
Ground talc (150-200 mesh), bulk	**10.00@22.00**
Vermont—Ground talc (20-50 mesh); bags	**7.50@10.00**
Ground talc (150-200 mesh); bags	**8.50@15.00**
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.50
(Bags extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.50

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton	
Centerville, Tenn.—B.P.L. 65%	6.00@ 8.50
Gordonsburg, Tenn.—B.P.L. 68-72%	5.50@ 6.00
Mt. Pleasant, Tenn.—Analysis, 65% B.P.L. (2000 lb.)	6.00@ 6.50
Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L.	7.00
Paris, Idaho.—2000 lb. mine run, B.P.L. 75%	4.50@ 5.00
Ottawa, Minn.—All crude silica sand	.75@ 1.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Clay Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@ 8.00
Centerville, Tenn.—B.P.L., 65%	6.50*
Benotis, Fla.—Analysis 77-82% B.P.L.	8.00
Montpelier, Idaho. — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50
Twomey, Tenn.—B.P.L. 65%	6.00@ 6.50

*Less $1.00 per ton dealer commission.

Florida Soft Phosphate

(Raw Land Pebble)

	Per Ton
Benotis, Fla.—Analysis 26-28% phosphoric acid—200 lb. sacks, carload lots	10.00
Florida—F. O. B. mines, gross ton, 68/66% B.P.L.	3.25
70% min. B.P.L.	3.55
72% min. B.P.L.	3.85
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

	Per Ton
Jacksonville, Fla., District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65% B.P.L.	5.75

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, bulk	8.00@10.00	8.00@10.00
Creme and royal, bulk	15.00@20.00	15.00@20.00
Slate granules		6.50@ 7.00
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)		12.50@18.50
Ingomar, Ohio (in bags)		8.00@25.00
Mertztown, Pa. (granite) bags, $10.00; bulk		8.00
Milwaukee, Wis.		14.00@26.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsburg, N. J.—Evergreen, bulk	8.00@10.00	8.00@10.00
Creme and royal, bulk	15.00@20.00	15.00@20.00
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—(2000 lb.)		6.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 12½c extra	4.50	4.50

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Carpenterville, N. J.	19.00	31.50@45.00
Easton, Pa.	16.00	40.00@60.00
Eau Claire, Wis.	15.00@20.00	25.00@40.00
Ensley, Ala. ("Slagtex")	16.00	26.00
Eugene, Ore.	25.00	35.00@70.00
Friesland, Wis.	22.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@45.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	15.00@16.00	28.00@75.00
Watertown, N. Y.	18.00@21.00	35.00@37.00
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	11.00
Boston, Mass.	15.00@16.50
Buffalo, N. Y.	16.50
Dayton, Ohio	13.50
Grand Rapids, Mich.	11.00
Lancaster, N. Y.	14.50
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Rives Junction, Mich.	12.00
Saginaw, Mich.	12.00
San Antonio, Texas	13.00
San Antonio, Texas (deliv. city lts.)	13.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	15.00
Winnipeg, Can.	15.00

Gray Klinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	25.00	16.00
Baltimore, Md.	24.25	17.85
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	20.00
Dallas, Tex.	23.50	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	20.00	19.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	.....
Seattle, Wash. (paper sacks)	24.00	.....

Portland Cement

Prices per bbl. and per bag net in carload lots.

	Per Bag	Per Bbl.
Atlanta, Ga.	.....	2.60
Boston, Mass.	.....	2.78@3.03
Buffalo, N. Y.	.....	2.88
Cedar Rapids, Iowa	.62	2.48
Cincinnati, Ohio	.63½	2.54
Cleveland, Ohio	.61½	2.46
Chicago, Ill.	.50	2.00
Columbus, Ohio	.....	2.49
Dallas, Texas.	.56¼	2.25
Davenport, Iowa	.60¾	2.43
Dayton, Ohio	.....	2.48
Denver, Colo.	.....	2.84
Detroit, Mich.	.62	2.28
Duluth, Minn.	.56¼	2.25
Indianapolis, Ind.	.60¾	2.41
Kansas City, Mo.	.61¼	2.45
Los Angeles, Cal. (less 5c dis.)	.....	3.16
Memphis, Tenn.	.....	2.84
Milwaukee, Wis.	.59¼	2.17@2.37
Minneapolis, Minn.	.62½	2.56
Montreal, Canada (sks. 20c ext.)	.....	2.25
New Orleans, La.	.....	2.90
New York, N. Y.	.....	2.65
Philadelphia, Pa.	.....	2.81
Phoenix, Ariz.	.....	3.30
Pittsburgh, Pa.	.56	2.24
Portland, Ore.	.....	3.05
San Francisco, Cal.	.....	2.61
St. Louis, Mo.	.58¾	2.35
St. Paul, Minn.	.62½	2.56
Seattle, Wash. (10c bbl. dis.)	.....	2.90
Spokane, Wash.	.....	.....
Toledo, Ohio	.62	2.48

NOTE—Add 40c per bbl. for bags.

Mill prices f. o. b. in Carload Lots to Contractors

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Cincinnati, Ohio	.....	3.00†
Concrete, Wash.	.....	2.60
Dallas, Texas	.....	2.15
Dayton, Ohio	.....	2.85†
El Paso, Tex.	.....	3.20*
Hannibal, Mo.	.....	2.10
Hudson, N. Y.	.....	2.20
Indianapolis, Ind.	.....	2.96†
Leeds, Ala.	.....	2.20
Los Angeles, Calif.	.....	2.80
Louisville, Ky.	.....	2.52
Memphis, Tenn.	.....	3.24†
Northampton, Pa.	.....	2.10
Phoenix, Ariz.	.....	4.30‡
Steelton, Minn.	.51½	2.06
Universal, Pa.	.50	2.00

*Gross, 10c sacks and 10c per bbl. disc 10 days
†Including cloth sacks.
‡Gross, 15c sacks and 5c per bbl. disc. 10 days

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement† and Gauging Plaster	Wood Fiber	White‡ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	11.00	11.50	.....	.....	33.75	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	16.40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

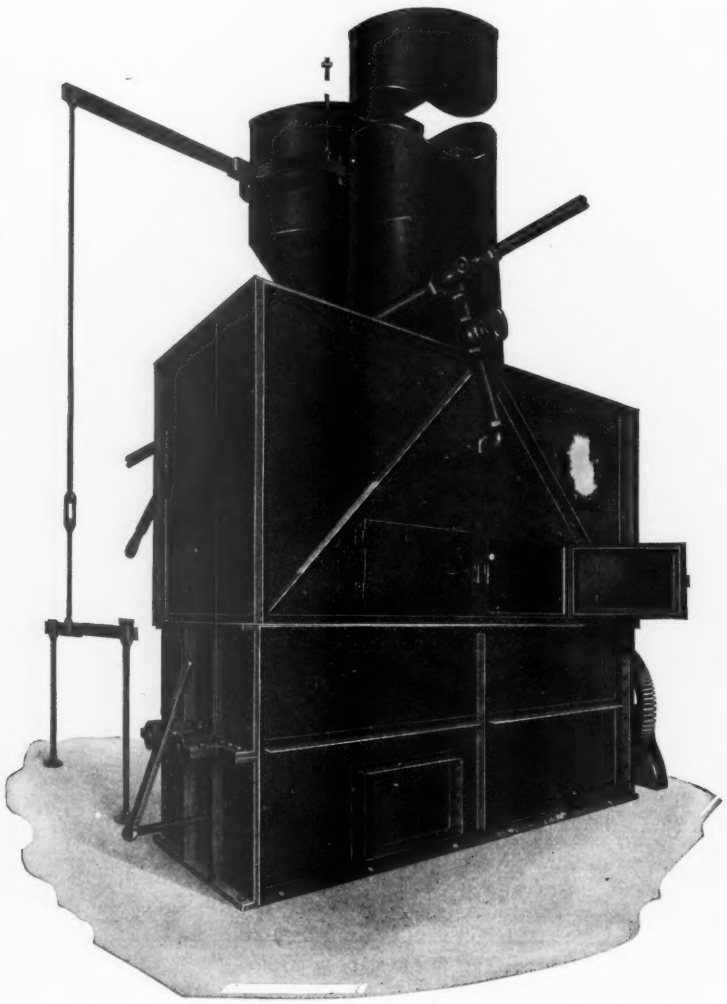
NOTE—Returnable Bags, 10c each; Paper Bags, $1.50 per ton extra (not returnable).
*Shipment in bulk 25c per ton less; †Rond plaster $1.50 per ton additional; ‡Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton

New Machinery and Equipment

New Batch Lime Hydrator

THE Weber hydrator was designed by Franz Weber, superintendent of the Washington Builders' Lime Co., Woodville, Ohio, and first described in ROCK PRODUCTS March 12, 1921.

Since then the machine has been redesigned and perfected and is now being placed on the market by Arnold & Weigel, contractors and engineers for lime plants, Woodville, Ohio.



The Weber hydrator which has been redesigned and perfected

Among the special features claimed for this machine are compactness, simplicity, mechanical correctness, economy and efficiency of operation. One of these hydrators occupies less than 58 sq. ft. of floor space. Two machines, side by side, can discharge into one common hopper.

Other claims made for the new hydrator are:

"Low upkeep—The entire machine being so simple and rigidly constructed eliminates the possibility of quick wearing. All bearings are cast iron, provided with grease cups, all gears cast steel, and all shafting cold rolled steel. The trough, hood, stack and weigh hopper are constructed of heavy metal, and all fittings, such as discharge gate, paddles and scale are designed for strength.

"Uniform quality—While the uniformity of the hydrate is, of course, dependent upon the raw material, the fact is, inspection and sampling can easily be done while operating in this machine, and should more lime or water be required, as the case may be, the batch may be held and dumped accordingly. The lime is held in the machine until thoroughly hydrated.

"Large capacity—While rated as a one-ton machine, experience has shown that this can be considerably exceeded without injuring the machine. It is built to take care of an overload. The quick charging and discharging arrangement enables the operator to run through four to six batches an hour. A batch can be dumped and a new batch filled in one minutes time. One man can take care of three machines.

"Thorough mix—In the process of hydration, the water combines with the caustic lime, due to natural chemical affinity. The lime is so agitated in this machine that the maximum superficial area of each particle of lime is exposed to the water quickly. Likewise this thorough agitation permits the excess moisture to pass off rapidly, resulting in a fluffy hydrate. Every particle of lime is turned over 16 times in a minute.

"Accessibility—All parts are accessible by man-hole doors. The main shafts may be taken out by unbolting and removing the end housing. All paddles are bolted and can be easily replaced.

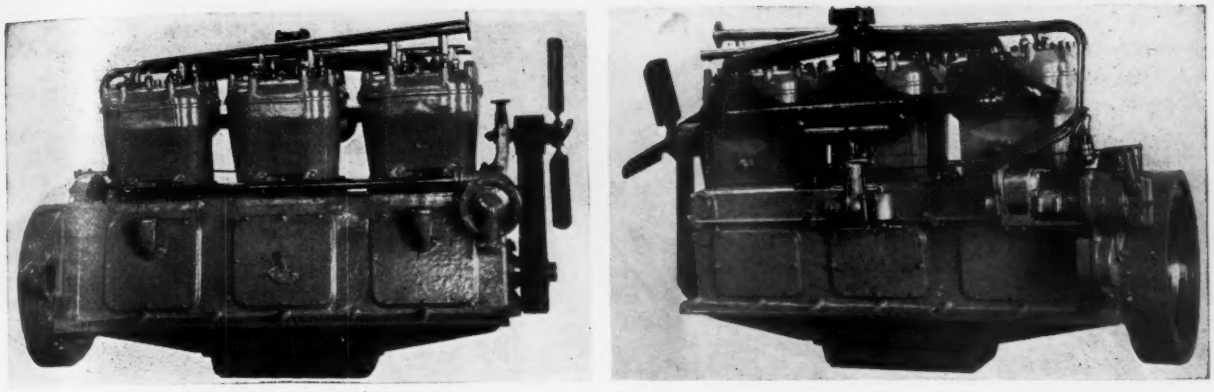
"Automatic—The operation of this machine is automatic in that, once the proper amount of water and raw lime is determined for any given lime, this ratio is maintained until changed by operator.

"Cleanliness—As will be noted from the cut, this machine is entirely enclosed. As anyone familiar with the practical side of hydrating lime knows, when the lime hydrates, the excess moisture passes off in the form of vapor and necessarily carries with it considerable lime dust. In this machine the hood is so designed that a large percent of this moisture condenses and with the dust from the lime adheres to the inside of stack, where it can be easily knocked down into the hydrator, and mixed in with another batch. There is no leakage, either from point of charging or discharging of batches.

"Quiet—The machine is quiet in operation, and runs steady without vibrating. The agitation paddles operate at a speed of 8 r.p.m. A brack-geared motor, 10 hp., with back-geared shaft running 108 r.p.m., is recommended."

Model R-6 Climax Engine

THIS engine was designed to meet a demand for an engine of 80 to 120 hp. and it has been built with six cylinders to se-



Right and left-hand views of the Model R. T. Climax engine showing accessibility of parts and the pump and magneto assemblies arranged to be removed as units

cure quiet running and continuous torque. The crank case has a deep section for rigidity and it provides for mounting on flanges below the center line, the logical way to mount a stationary engine. It is provided with handholes which make the interior easily accessible. Timing gears are mounted next to the flywheel to secure quiet running and long service.

The flywheel housing is detachable and forms a cover for the gears. The oil pump is bolted to the crank case and is a compete unit. It is driven by means of spiral gears from the crank shaft. The oil pump discharges through a drilled hole in the crank case to a steel manifold which distributes oil to the main and camshaft bearings. At the end of the manifold is the relief valve for controlling the pressure, the overflow from which passes through the crank case and spills over onto the timing gears. The entire oiling system is easily cleaned and inspected.

The cylinder barrels are in the form of renewable sleeves of the semi-floating type. This insures a wall of the proper hardness, thin enough to secure the desired cooling. The cooling water comes into direct contact with the cylinder sleeves. The advantage of the semi-floating feature is that the cylinder barrel does not tend to get out of round with temperature changes.

The water pump with its drive is a complete assembly which may be removed as a unit. It is driven by a cross shaft through helical gears at the front end of the camshaft. The governor assembly is also a complete unit which may be removed without disturbing other parts.

The ignition is an independent dual system, battery and magneto. The timing of the two distributors is synchronized so that the engine may be operated with two sparks, a decided advantage in heavy duty engines. Each cylinder has two spark plugs. The magneto bracket assembly, including the principal ignition parts, may be removed as a unit.

The engine is made by the Climax Engineering Co., 2 West 18th avenue, Clinton, Iowa.

A New Principle in Flexible Couplings

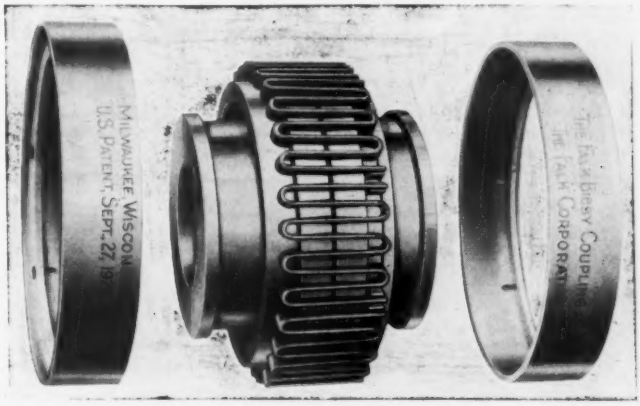
AMONG the interesting exhibits at the American Mining Congress, Milwaukee, was the Falk-Bibby flexible coupling, made by the Falk Corporation of Milwaukee.

This coupling was invented by an Englishman, James Bibby, who sold the right of American manufacture to the Falk Corporation.

The coupling belongs to that class which is truly flexible, since it utilizes the elastic properties of some substance to secure flexibility, and does not depend upon the displacement of parts within clearances provided in the clutch. The elasticity in this coupling is provided by a special form of grid spring of tempered steel, which makes it capable of withstanding an unusual degree of both parallel and angular mis-alignment of the shafts.

However, the makers claim that the special feature of this coupling is its torsional resiliency and consequent shock absorbing properties obtained from the action of the springs which engage with specially constructed grooves around the periphery of the flanges. These grooves fit the springs at the ends farthest apart, but flare towards each other.

Under a light load each bar or element of the spring is flexed between points which are separated by the maximum distance. The flexibility of the spring under these conditions is proportioned accordingly. As the load increases the springs wrap themselves around the walls of the inwardly flaring grooves which are especially curved for the purpose, so that increasing load shortens the effective span of each spring bar, causing it to offer greater resistance to flection without increase of stress. This produces torsional flexibility with increasing resistance to increasing torque and gives the coupling great power to cushion heavy shocks and to damp out torsional oscillations.



The Falk-Bibby coupling employs a steel spring to secure flexibility

The working parts of the coupling are enclosed in a floating shell which is packed with lubricant. The shafts can be aligned as easily as with flange couplings and can be disconnected in a few moments by simply releasing the shell and removing the springs around the periphery of the flanges.

The Falk-Bibby coupling is strictly a precision product and the working parts (flanges and springs) are made entirely from steel. On account of its peculiar construction this coupling is smaller, lighter and more easily disconnected than any flexible coupling of similar capacity.

One-Third More Fertilizer Sold in Arkansas This Year

ACCORDING to the 1922-23 fertilizer report of the State Department of Mines, Manufactures and Agriculture, filed recently, more than a third more fertilizer was sold this year than the year before. The season reported on October 1, 1922, to September 30, 1923, shows the sale of 74,774.25 tons of fertilizer. The same period last year showed the sale of only 40,324.34 tons. Officials in the department recently said that the increased sales do not necessarily mean increased acreage. Heavy rains in the spring which necessitated replanting and refertilization are responsible in some measure for the increased sales.

The heaviest sales were, as usual, in March, when 27,836.85 tons were bought.—*Little Rock, Ark., Gazette.*

Non-Acid Phosphate Process to Be Used in Tennessee Plant

THE organization of a $400,000 stock company which promises to revolutionize the phosphate business of Tennessee was announced here recently.

The new corporation, to be known as the Non-Acid Phosphate Co. of Tennessee, has acquired from the Consolidated Phospate Co. some 700 or more acres of land in the Gordonsburg section which will mine many millions of tons of high grade phosphate rock. This property lies well and through it runs the Swan Creek railroad, a branch of the Louisville & Nashville.

The new company is headed by some of the most widely known phosphate men of the South. At the head as president will be Col. John W. Fry, with Dr. A. H. Grigsby of Centreville, vice-president and general manager; J. C. Lowman, secretary and treasurer; Eugene Anderson of Columbia and Frank S. Wheeler of Mt. Pleasant, directors. Among the stockholders are Col. Joseph F. Brownslow, W. B. Greenlaw, George E. McKennon, Charles A. Parker and other leading business men of Columbia and Maury county.

Officers of the organization department will be opened in the Woldridge building with a force of between 50 and 60 organization experts on the job.

An entirely new process to this section will be used in making the phosphate available to plant life. Just here it should be said that since the beginning of the commercial fertilizer industry the only successful treatment of phosphate rock to make it available as plant food has been the German process of treating with sulphuric acid.

The new non-acid process, discovered by Dr. A. L. Kreiss, is declared to be a demonstrated success. Dr. Kreiss, after making his discovery, interested capital and established the first plant at Bunswick, Ga., but owing to inceasing demands made upon it this plant was unable to fill orders. Another big plant was then erected at Lakeland, Fla., and this also proved a great success on field tests. Based on the success of these plants a big treating plant was established in the Florida fields, and although it has been operating night and day, it has been unable to fill the demands made upon it, it is said. The demand has so far outgrown production that the organization in the Tennessee field was decided upon. Freight rates are favorable and the product, it is said, can be delivered from this section much more cheaply than from the Florida fields.

A. L. Kreiss, discoverer of the process, will be the consulting engineer for the Gordonsburg plant and will devote all time necessary to keep it running smoothly.

It is said that the new plant will furnish employment to approximately 200 men.—*Nashville, Tenn., Banner.*

Fertilizer Trade Prospects Brighter

IT may be several years before the industry has accommodated itself to conditions fully, according to Gustavus Ober, president of G. Ober & Sons, and a nationally known authority on the fertilizer business, but indications are that the coming year will see encouraging strides toward "normalcy."

"The principal reason for the present unfortunate condition of the fertilizer industry is traceable to the war," said Mr. Ober recently. "As in all other lines, rapid expansion was necessary to meet the unprecedented demands upon it and the industry flourished under these abnormal conditions. Then with peace came the need for readjustment, and the need never has been entirely filled.

"The position of the farmers of the country has much to do with the fertilizer industry and their ability to buy, together with their prospects, should serve as a barometer for the fertilizer trade. Just now wheat growing is the sore spot in the agricultural industry. Wheat growers, however, require a comparatively small percentage of the fertilizer produced.

"The heaviest consumers of fertilizer are cotton growers, and consequently the condition of the cotton planters has a vital effect on the fertilizer industry. They have received high prices for their last crop and now are fairly prosperous. The prospects, therefore, are that the demand for fertilizer in the spring will go far toward solving the problem confronting fertilizer manufacturers.

"I believe it is safe to predict that the consumption of fertilizer during the year 1924 will at least equal that of 1914, the last really normal year for the industry. This does not mean necessarily that conditions existing then will be paralleled, as the facilities for manufacturing fertilizer are much greater now, but the overproduction should be materially reduced."—*Baltimore (Md.) Sun.*

Rock Asphalt Deposit Near El Dorado Springs, Mo.

A MEETING of the Chamber of Commerce was held last Friday night, the object of which was to discuss and take steps toward developing the rock asphalt fields, which lie a short distance southeast of the city limits.

For a number of years it has been known that deposits of rock asphalt in large quantities existed in this locality, but this was the first organized effort that has ever been made to develope the same. According to statements made before the Chamber of Commerce, practically unlimited quantities of this material, which is said to be superior to all others for road purposes, exist in this vicinity, being especially plentiful on the farm of S. G. Banks and the Tuckahoe farm of Dr. A. B. Freeman, both of which are in the same locality.

Recently a quantity of this rock was taken from the farm of Mr. Banks and was ground in the grinder of C. W. Albertus, south of town, and a quantity of the ground product was on exhibit at the meeting. The ground product when pressed together is very cohesive in character and all who were present were greatly impressed with its possibilities as a road building material.

In building roads with it, it is said that no preliminary preparation of the roadbed is necessary, it making a very superior highway when placed in sufficient thickness on top of the dirt properly graded and rolled. It is also stated that it makes an ideal wearing surface for any kind of hard surfaced road or street paving.

The deposit of rock asphalt here is believed to be similar and equal in every way to the Kentucky asphalt, which is considered the standard of excellence for this class of material, it being shipped from that state to all sections of the United States, and if this proves to be true it is not improbable that a company may be organized in the not distant future to mine the product here in large quantities.

The deposits here are from 6 to 25 ft. underground, and it would be a comparatively easy matter to mine it upon a large scale and at a minimum of expense, and it would make it the cheapest road material that could be secured for finishing streets and highways in this vicinity.

At the meeting Friday night it was decided to have a quantity of the material mined and ground and make a test with it on a section of street somewhere within the city limits. A committee, headed by Dr. Freeman and S. G. Banks, was appointed for the purpose of ascertaining the cost of mining, grinding and applying the material so that the cost of a test project might be arrived at. Dr. Freeman stated recently that the committee was already at work and that a drill would be sunk to determine the thickness or "face" of the asphalt rock, and that they would soon know just about what it would cost per ton to mine and grind.

News of All the Industry

Incorporations

S. J. Duntile and Concrete Products Corp. of New Jersey has been capitalized for $125,000. Their address is Roberts Bldg., Somers Point, N. J.

Carolina Lime Co. of Charleston, S. C., has been chartered to mine phosphate rock and manufacture chemicals, acids and fertilizers. M. M. Hutchinson is president.

Ornamental Hard Plaster Co., New York, N. Y.; composition products; $100,000. Incorporators: H. T. J. Fuehman, Brooklyn, N. Y.; Emil Pangel and Allen Glassman, New York. Representative, Martin E. Smith, Wilmington, Del.

Superior Rock Asphalt Co. of Kentucky has been incorporated in Delaware for $750,000.

Belvoir Stone and Supply Co., South Euclid avenue, Cleveland, Ohio, has been incorporated for $140,000.

Rock Sand and Gravel Co. has been incorporated in Cincinnati, Ohio, for $25,000 by John M. Renner and Ross Montague.

Bone Dry Lime Corp. has been incorporated for $300,000 to $550,000. The company's address is Jamaica, N. Y.

Art Stone, Inc., is a new company capitalized for $300,000. The place of business is San Francisco, and the incorporators are Martha M. Hughes, Alice Orcut, J. J. Hughes, Oscar Koehn and J. B. Cooper.

Northeast Missouri Sand and Gravel Co., chartered with a capital of $5000, at Hannibal, Mo.

Schumacher Stone Co., Pandora, Ohio, has been incorporated for $18,000 by Fanny Schumacher.

Whitehouse Trap Rock Co., trap rock and sandstone; $50,000. August C. Streitwolf, New Brunswick, N. J.

Mapleton Limestone Co. has been incorporated by W. B. Simpson, Richard Simpson and Fred M. Simpson, all of Huntington, Pa.

Orleans Sand and Gravel Corp., Buffalo; sand and gravel business; capital, $100,000. Incorporator, R. C. Parsons, Buffalo, N. Y.

California Qarries Corp., Los Angeles. Capital stock, $200,000; shares 8000, subscribed $75.

Nel-Stone Co., Atlanta, Ga.; capital $250,000.

Salado Gravel Co., San Antonio, Texas; capital stock, $12,000. Incorporators: P. M. Chouke, D. F. Cheatham and P. W. Rafalsky.

Superior Rock Asphalt Co. of Kentucky, Dover, Del. Mining of stone, rock, etc.; capital, $750,000.

St. Louis, Mo. Plattin Sand & Gravel Co. chartered with a capital of $50,000.

American Fused Silica Corp., New Brunswick, N. J.; fused silica products; 10,000 shares of stock, no par value. Incorporators: Richard F. Ritter, Paul W. Ewing and Whitfield Farrington, 101 Albany street, New Brunswick.

Palmer Calcite Co., Texas (Baltimore Co.), Md., has been incorporated to operate limestone properties by Richard E. Tome, Carville D. Benson, Jr., and Thomas W. Welsh, all of Texas. Capitalization, $400,000.

California Quarries Corp. has been incorporated in Los Angeles, Calif., with a capital stock of $200,000, by George P. Sorenson, C. A. Keen, Jr., and H. E. Robinson.

Daugherty Sand & Gravel Co. has been incorporated in Ardmore, Okla., with a capital of $25,000, by E. F. Holmes, B. L. Gray, both of Ardmore, and J. C. Skerl, of Wilson, Okla.

Blue Ridge Park Mica Co. has been incorporated in Winston-Salem, N. C., with a capital of $150,000, by S. C. Park, George W. Steck and others.

Baker Sand and Gravel Co., Inc., of Tuscaloosa; J. E. Baker, G. K. Little and Mary Lou Baker, incorporators. Capital authorized, $40,000, fully paid in; dealers in gravel and sand.

Ashland Limestone Co., quarrying, $600,000, R. F. Hill, Josephine Hill, Orange, Va.; W. S. Hoge, Jr., Washington.

Lavia Artificial Stone Co., Inc., capital $10,000. Directors are Pasquale Pantano, 8788 22d ave., and Louis Lavia and Lucretia Lavia, 1257 70th st., Brooklyn, N. Y.

Silica Asphalt Co. has been incorporated under the laws of the state of Delaware for $5,000,000.

Buff Ridge Stone Co. has been incorporated for $50,000 by Robert Reed, Wm. E. Powers and Robert L. Mellen, at Bedford, Ind.

Rauscher Lime Co. is the name of a new concern chartered recently at Erwin, Tenn., with a capital of $25,000 for the production of lime, the plant to be located at Erwin. The incorporators named in the application for charter are E. W. Rauscher, Jr., of Erwin, W. R. Wyatt, and others. Mr. Rauscher, president, advises a plant will be at once established with a daily production of 1000 bbl. of lime. Mr. Wyatt is manager.

Sand and Gravel

Alabama Concrete Products Co. is building a gravel plant with a daily output of about 250 cubic yards of gravel, near Selma, Ala.

A gravel mining company, known as the Hesperides Mining Co., has started operations just east of the town of Wallace, Calif. Sluice boxes and plates have been installed to catch the gold. When the sand has been run through the boxes it will be sold as first grade wash sand. A gravel crusher will soon be installed to make commercial gravel. At present six men are empolyed but it is expected that a larger crew will be added later. Water to operate the sluices is being pumped from the Mokelumne river.

Sac River Sand & Gravel Co. of Osceola, Kan., which has been in the hands of receivers for several weeks, was sold at auction last Tuesday and was purchased by the St. Clair Investment Co. of Osceola, the consideration being $3500. The new owners will probably improve the plant and conduct it on a paying basis.

William M. Eager of San Antonio, Texas, has disposed of 100 acres of timber land, running east of the Illinois Central railroad to the Tangipahoa river at Roseland, La., to H. M. Hollaway, representing persons who propose to establish a sand and gravel plant on a large scale, with modern equipment. This will make three gravel plants, the Jahncke plant, the State Gravel Co. and the new company, located between the two, within a radius of three miles. Mr. Eager was paid $10,000 for the property, and Mr. Holloway will commence at an early date to arrange for the opening of a large gravel and sand plant.

Keystone Gravel Co. is the new name of the Indiana Excavating Co. of Indianapolis, Ind.

Edgeton Concrete Products Co. is to establish a plant for the manufacture of lightweight concrete tile and other concrete products this year at Wilson, N. C., 202 Planters Bank building, according to a recent announcement by an official of the company. Daily capacity of hollow tile will be about 5000.

The Seattle Sand & Gravel Co. plans the construction of gravel bunkers, washing and screening platforms, spur track, dock, etc., at 9460 Rainier avenue, Seattle, Wash. The construction work will be handled by the company and will represent an expenditure of $10,000.

The new gravel pit at Marquette, Kan. is attracting considerable attention over the state among road builders and city pavers. It is said there is enough gravel in the pit to hard surface 15,000 miles of road and it is of an exceptionally fine grade. It contains a high percentage of iron oxide, which acts as a binder to the gravel and when put on a road or street, it gets as hard and smooth as pavement. The Missouri Pacific recently completed a spur to the pit and much of the gravel is now being hauled. The city of McPherson is using it on some of their outlying streets with excellent results.

Crushed Stone

Marengo Stone Co., Marengo, Ind., is having its plant repaired and will resume construction shortly.

Western States Gas and Electric Co. have donated 800 tons of crushed rock to repair the highway between Camine and Riverton, Calif.

Ladd Lime and Stone Co. has changed its office address from Atlanta to Cartersville, Ga.

Muncie, Ind., Stone and Lime Co., which a little more than a year ago began operations at the quarry at Hoyt avenue and the Cornbread road, in Muncie, is now working to its full capacity.

Cleveland (Ohio) Stone Co. directors have declared the regular 6 per cent dividend for the year and also a 1 per cent extra dividend for the first quarter. Stockholders will be paid 2½ per cent on December 1.

Damage of about $2000 was done at the city stone-crusher plant on Jefferson avenue, Salem, Mass., when fire of unknown origin destroyed the boiler shed and damaged the elevator.

Andrew Wilson, manager of the Western Quarries Co., Tenino, Wash., plans extensive development at the quarry this winter, and a much larger output next year.

The Chaplin & Anderson Stone Co., Springfield, Mo., will erect a plant on Prospect avenue to cost about $25,000.

An injunction was granted to Harris P. MacNeish, an instructor of mathematics in the College of the City of New York, recently, against the Tuckahoe Stone Corp., Tuckahoe, N. Y. (a suburb of New York City), by Supreme Court Justice Joseph Morschauser, restraining the corporation from quarrying and crushing stone in a park at Tuckahoe, where Professor MacNeish and others have their country homes.

Lime

The Carolina Lime Co., 199 Meeting street, Charleston, S. C., is perfecting plans for the operation of a local plant for the manufacture of fertilizer products. E. H. Hutchinson is vice-president, in charge.

The Berry-Treadwell-Tripp Co., a new firm in the building supply field formed recently, with headquarters in the Haas-Howell bldg., Atlanta, Ga., has been appointed southeastern distributors for Bowdon's white lime, produced in the plant of the Calera Lime Works, at Calera, Ala., covering the Georgia, Florida, and North and South Carolina territory. The new material firm is headed by Turner E. Berry, identified with the brick industry at Columbus, Ga., for a number of years. The lime manufactured at the Calera works is extensively used throughout the Southeast.

Superior Lime and Hydrate Co., which was established during the past summer at Pelham, Ala., started its plant this month operating on a day and night capacity basis, due to recent increase in demand for its product. It is one of the most modern lime producing plants in the southeastern territory, with a daily capacity for 500 bbl.

Puntenney Lime Co., at Puntenney, north of Prescott, Ariz., had its warehouse burned recently, together with a Santa Fe freight car that was on the warehouse siding. The loss to the lime company was about $8000, mainly in the destruction of a carload of barrel staves lately received.

Silica Sand

Tavern Sand Co., Millville, N. J., has commenced the erection of a new site about three miles from the city, for the production of washed silica sand, to cost approximately $100,000 with machinery. It is said to be affiliated with the Illinois Glass Co., Alton, Ill.

Florida has a good deal of sand, as well as a good deal of limestone. From these two natural products a good quality of sand-lime brick is made. Sand has many uses, for building, paving and road making, filtering, molding, cutting, grinding and blast purposes. With sand and lime, concrete is made. Glass sand abounds, and a glass factory is being built at Jacksonville. The sand beaches of the Florida seacoast are the finest in the world. The sand of Florida is an asset, says the Jacksonville, Fla., Times Union.

The National Plate Glass Co., Detroit, a subsidiary of the General Motors Corporation, has placed the steel for a new plant at Blairsville, Pa., and inquiry has gone out for the cranes and equipment. This business will be placed in Detroit.

Cement

Globe Portland Cement Co., 416 McKnight bldg., Minneapolis, Minn., will hold in abeyance the construction of its proposed mill at Dubuque, Iowa, for which plans recently were prepared by Charles L. Pillsbury, Capital Bank bldg., St. Paul, Minn., engineer, with cost estimated at $2,000,000.

Dick Long and associates of Muskogee, have taken over the properties of the old Tulsa Portland Cement Co. and are installing there a Kennedy ball-bearing crusher, which is the largest in the state. Long has stated that the ultimate plan of his company is to construct a cement plant.

Choctaw Portland Cement Co. has been refinanced with the idea in view of moving the plant and its equipment to Tulsa on a location southeast of the city on the Midland Valley railroad. The plant is now located at Hartshorne. Joseph T. Lantry is at present operating the plant as a rock crusher.

The Guadalupe Portland Cement Co., San Francisco, Calif., closed today for 259 acres back of the Almaden mine, which is generally known as the Costello ranch. Maurice Pope, of San Francisco, sold the property to the cement company for $70,000. The land is supposed to contain cement rock, which the company will develop and put on the market.

Yosemite Portland Cement Co. has received 20 carloads of machinery for installation in its new plant at Merced, Calif.

Carl Leonardt, president of the Southwestern Cement Plant, which is under construction in Fort Worth, has just arrived in New York from Germany, where he has been gathering data on the latest developments in the manufacture of cement and its uses. While in Germany he also secured plans for his plant in Fort Worth.

Recent improvements in construction throughout the southeast is keeping the cement producing industry in the district operating at full capacity, and with manufacturers looking for continued activity the rest of this year and well into 1924, according to information received in Atlanta from a number of the larger companies in the southeastern field. Virtually all of the larger companies in the Georgia, east Tennessee and Alabama territory report a marked betterment in volume of business booked the past month, both as compared with the late summer months and with the same period a year ago. Shipments from the mills during October were greatly in excess of shipments during October, 1922, and in a number of the larger plants of the district new production records were established last month.

The South Dakota State Cement Commission is preparing lists of all dealers, highway contractors and other large users of cement in the state, preparatory to the completion of the plant at Rapid City, according to a reported interview with S. D. Donaldson, member of the cement commission at Yankton. Mr. Donaldson said that barring unforseen delays, the plant will be turning out cement by June.

The Cement Securities Corp., Denver, Colo., which is operating eight plants, including one at Ada, Okla., has five Sullivan drilling cores at work on a property directly east of Garnet, Okla. Six more cores are in transit and will be put into operation immediately upon arrival here. If these tests prove satisfactory it is the intention of the company to build one of the largest plants in the country at Garnet.

A complaint has been filed by the Atlas Portland Cement Co. against the Southern Railroad Co. and other freight carriers, alleging that the rates charged from Navarro, Northampton county, Pennsylvania, to various points are higher than rates charged and collected for the shipment of cement from Universal, Northampton county, the Public Service Commission announced today. The company declares the rates are unreasonably preferential and prejudicial.

Contract for six new cement tanks has been let by the Lawrence Portland Cement Co. at its Northampton, Pa., plant. The work will be performed by a Chicago firm and will begin this week. Quite a large force of men will be quartered in Northampton while the erection goes on.

Isabella M., Helon E., and Samuel H. Cowell have deeded approximately 1000 acres of land near Cowell, Calif., together with considerable subdivided property in and near Concord, to the Cowell Portland Cement Co., according to instruments filed with the county recorder. Some of the property was transferred to the Cowells by the Bay Point and Clayton Railroad Co. and in turn deeded by it to the cement concern.

Cement shipments in the Lehigh field continue heavy and in view of the lateness of the season are considered remarkable. It appears certain that mills will continue to operate throughout the winter, says the Philadelphia Ledger.

The New Egyptian Portland Cement Co. is planning to increase the capitalization from $1,000,000 to $2,000,000 to provide funds for extensive enlargement of its plant facilities. This will include the doubling of the size of the Port Huron plant. According to E. R. Sullivan, secretary-treasurer, October was the largest month in the company's history, with approximately 90,000 bbl. of cement shipped. He states that in anticipation of continued heavy business for November and December, officers expect to keep the Port Huron plant running at capacity nearly all winter, and the Fenton plant as much of the winter as weather permits. Big demands from the state, counties and cities are expected to make 1924 another big year in the cement business.

Tests for suitable sites for the proposed state owned cement plants in Michigan have almost been completed by Richard A. Smith, state geologist. He will make his report to the administrative board in the near future, after which further plans can be made. According to Governor Groesbeck, two particularly favorable sites are indicated by tests. In both instances there are extensive deposits of limestone and shale. One is near Charlevoix, the other near Afton, Charlevoix county.

Concrete Products

Excelsior Concrete Products, Ltd., Chatham, Ont., have been incorporated.

Rene de Montigny, Montreal, has been registered and will manufacture cement blocks.

John Keenan, Hornell, N. Y., is enlarging his concrete products plan and will add equipment for making cement brick.

The Associated Concrete Industries of Los Angeles and vicinity is planning to send a special car of delegates to the annual meeting of the national technical body in Chicago, it was learned today. The delegates will go by invitation of officers of the national association, and will explain the plan by which the local body functions. The convention is to be held in Chicago, in February, 1924.

Pottsville Building Block Co., 1601 Market street, Pottsville, Pa., W. J. Biever, president, has tentative plans for the construction of a new plant for the manufacture of cement building blocks, etc.

Cyrus M. Long has engaged in business in Auburn, Wash. as the Auburn Concrete Products Co.

The Detroit Concrete Receptacle Co., Detroit, Mich., of which M. E. Von Mach is president and treasurer, will build an office and factory on Woodward Heights boulevard next year, at a cost of $250,000.

Granite Brick & Block Co., of Sebring, Fla., officials say that the company has recently acquired a site there, and will immediately construct a plan for the manufacture of cement blocks, ornamental vases and urns, and fancy cement face brick. The concern was recently organized by M. W. Baker, of Sebring.

Kellastone Stucco Co. of Porterville, Calif. has opened a quarry and is crushing rock to make pebble dash.

Granitone Products Co. is building a stucco, flooring and mortar plant in Kansas City, Kan.

Gypsum

The McFarland Eng. Co., of Paris, Ont., Canada, intends shortly to begin building a plaster mill in Ontario. G. W. McFarland is in Chicago this week to see about machinery for the plant.

United States Gypsum Co. will erect a new plant at Sweetwater, Texas, to cost about $1,000,000. G. W. Rathpens is engineer.

Agstone

Between 1800 and 2000 tons of limestone will be used in Taylor county, Ky., this year in building up farm lands for bigger crop yields, according to a report of County Agent William Johnstone. This will be far in excess of the goal set for the county.

A big ditcher working in peat beds on the Frank Fink farm in the northwest part of Freeborn county, Minn., cut through a bed of marl more than three feet thick. Borings have disclosed that the bed underlies part of the Fink farm, and the adjoining farm.

Slag

The Birmingham Slag Co., H. G. Ireland, general manager, and C. E. Ireland, sales manager, has two large slag plants for the preparation of basic slag for highway and general construction work. One is located at Ensley and the other at Alabama City. From these plants material has been furnished for hundreds of miles of Southern highway and many of the largest reinforced concrete buildings. The Birmingham Slag Co. is also making a new type of brick, from ground slag and cement, called Slagtex brick.

Trade Literature

Whitewash and Cold Water Paint is the title of an excellent pamphlet issued by the National Lime Association. Free copies may be had from any member of the association, from the Central Division, Chicago Temple building, Chicago or from the Eastern Division, Insurance building, Washington, D. C.

Electric Motors—How to Choose and Use Them is a very valuable little book issued by the Reliance Electric and Engineering Co., of Cleveland, Ohio. It does just what the title promises; tells you how to choose a motor for your work and to care for it after it is installed. Sent on request.

Space is the title of a folder issued by the Standard Conveyor Co. of North St. Paul, Minn. It describes the company's spiral conveyor.

Coyle and Roth, Minneapolis, Minn., issue a folder on rotary screen. This describes screens especially suitable for small sand and gravel operation and cement block plants. It also shows their balanced action shaker screen which works without vibration.

The Cleveland Friction Clutch is described in a handsome pamphlet issued by the Western Eng. and Mfg. Co. of Chicago, the makers of the clutch. It is well illustrated and gives dimensions of the different sizes.

Morris Machine Works, Baldwinsville, N. Y. has issued a catalog of pumps for dredging sand and gravel that is handsomely bound and illustrated. In addition to the information concerning the pumps made by the company, it gives many useful tables and instructions for operating dredge pumps. Every dredge operator will appreciate the value of this book.

Sauermann Bros., Chicago, puts out their pamphlet No. 22, which is one of the best of their many publications. Its 32 pages are full of illustrations and facts regarding dragline operations. It is sent on request to anyone interested.

Columbus Consumers Supply Co. has issued an attractive folder showing prices on building materials. It calls it appropriately "Zip Zip Service."

The Osgood Co., Marion, Ohio, has issued its bulletin No. 236 on the 1¼-yd. heavy-duty shovel, which may be used as a shovel or dragline or as a crane with clamshell bucket. It is fitted with either continuous tread or truck mounting.

Personal

R. H. Black, who has had charge of engineering and designing for Arnold & Weigel for the past three years, has taken an indefinite leave of absence owing to the loss of his wife. He expects to be located in Pittsburgh this winter.

Mr. Van Saun, of the Kennedy-Van Saun Manufacturing and Engineering Corporation, 50 Church street, New York, has just returned from an extended trip to California where he designed and built several crushed stone plants. The most notable was the plant supplying the stone for the Hetch-Hetchy dam which is to impound San Francisco's water supply.

Rock Asphalt

Vernon Asphalt Co., Nevada, Mo., recently organized with a capital of $150,000, is planning the establishment of a plant for the production of asphalt, with installation of electric power equipment, reduction machinery and auxiliary equipment estimated to cost about $80,000. John A. Lohmeyer, Joplin, Mo., is president; and L. A. Johnson, Nevada, secretary.

The Annual Review and Directory Number

December 29th Issue of ROCK PRODUCTS

THE Annual Review and Directory Number will contain a review of the passing year, summarizing progress in the rock products industry, assembling in graphical form, all the facts concerning fluctuating prices of materials, and the variations shown in different locations.

It will contain a description of the feature plants built during 1923 in each industry; all the progress made in machinery and methods during the year and the usual editorial contents that have made ROCK PRODUCTS the authoritative business journal of the industry.

Plus this, there will be the Directory—the buyer's guide—containing a complete list of manufacturers whose machinery or equipment enters into the rock products industry. This "Handy Reference" will be in use during the entire coming year.

The Annual Review and Directory Number has proven its value and convenience. It is an efficient and economical medium reaching a buying power of sufficient volume to make your advertising an immediate sales factor, and a tremendous aid in the building of a permanent consuming market.

Regular Space Rates are in effect for this number.

Send your Space Reservation in now.

Forms Close December 17

Rock Products

542 South Dearborn Street
Chicago, Ill.

Member A. B. C. **Member A. B. P.**

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Air Compressors
Pennsylvania Pump & Compressor Co., Easton, Pa.
Smokeless Oil Burner Co., Bucyrus, Ohio

Air Separators
Rubert M. Gay Co., Inc., New York, N. Y.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mchy. Co., Kingston, N. Y.

Automatic Weighers
Merrick Scale Co., Passaic, N. J.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Babbitt Metal
Ajax Metal Co., Philadelphia, Pa.

Bags and Bagging Machinery
Jaite Co., Jaite, Ohio
Valve Bag Co. of America, Toledo, Ohio

Balls (Tube Mill, etc.)
Hadfield-Penfield Steel Co., Bucyrus, Ohio

Belting
New York Belting & Packing Co., New York City

Belt Fasteners and Hooks
Crescent Belt Fastener Co., New York City

Belt Lacing and Rivets
Crescent Belt Fastener Co., New York City

Bins and Bin Gates
Austin Mfg. Co., Chicago, Ill.
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Boiler Insulation
Celite Products Co., Chicago, Ill.

Boilers (Water Tube)
Jackson & Church Co., Saginaw, Mich.

Box Car Loaders
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Brick (Insulating)
Celite Products Co., Chicago, Ill.

Brick Machinery
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Jackson & Church Co., Saginaw, Mich.
Shope Brick Co., Portland, Ore.

Buckets (Dumping)
Penn Fdy. & Mfg. Co., Reading, Pa.

Buckets (Elevator and Conveyor)
American Manganese Steel Co., Chicago Heights, Ill.
Austin-Western Road Machinery Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, Ohio
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Buckets (Grab, Clamshell, etc.)
Browning Co., Cleveland, Ohio
Clyde Iron Works Sales Co., Duluth, Minn.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, Ohio
Orton & Steinbrenner, Chicago, Ill.

Burr Mills
J. B. Ehrsam & Sons, Mfg. Co., Enterprise, Kan.

Cableways
Clyde Iron Works Sales Co., Duluth, Minn.
Interstate Equipment Corp., New York, N. Y.

Calcining Kettles (Gypsum)
American Process Co., New York, N. Y.
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kan.

Car Movers
Atlas Railway Supply Co., Chicago, Ill.

Car Pullers
Ottumwa Box Car Loader Co., Ottumwa, Iowa
Thomas Elevator Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Cars (Quarry)
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Penn Fdy. & Mfg. Co., Reading, Pa.

Cement (Insulating)
Celite Products Co., Chicago, Ill.

Chain (Steam Shovel)
Carroll Chain Co., Columbus, Ohio

Chain Drives
Link-Belt Co., Chicago, Ill.

Clamps
Knox Mfg. Co., Philadelphia, Pa.

Coal
Bertha-Consumers Co., Pittsburgh, Pa.

Coal Pulverizing Equipment
Fuller-Lehigh Co., Fullerton, Pa.
K-B Pulverizer Co., New York City
Rubert M. Gay Co., Inc., New York, N. Y.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

Conveyors and Elevators
Austin Mfg. Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, Ohio
Kennedy-Van Saun Mfg. & Engineering Corp., New York City
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Smith Engineering Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
United Iron Works, Inc., Kansas City, Mo.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.

Couplings
Knox Mfg. Co., Philadelphia, Pa.

Cranes (caterpillar)
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, Ohio
Thew Shovel Co., Lorain, Ohio

Cranes (Locomotive)
American Hoist & Derrick Co., St. Paul, Minn.
Browning Co., Cleveland, Ohio
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., Marion, Ohio
Thew Shovel Co., Lorain, Ohio

Cranes (Overhead Electric Traveling)
Morgan Engineering Co., Alliance, Ohio

Crushers (Hammer)
Jeffrey Mfg. Co., Columbus, Ohio
Pennsylvania Crusher Co., Philadelphia, Pa.

Crushers (Jaw and Gyratory)
Acme Road Machinery Co., Frankfort, N. Y.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Earle C. Bacon, Inc., New York, N. Y.
C. G. Buchanan Co., New York City
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kan.
Rubert M. Gay Co., Inc., New York, N. Y.
Kennedy-Van Saun Mfg. & Engineering Corp., New York City.
Morgan Engineering Co., Alliance, Ohio
New Holland Machine Co., New Holland, Pa.
Smith Engineering Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
United Iron Works, Inc., Kansas City, Mo.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo. (Jaw)

Crusher Protectors
Dings Magnetic Separator Co., Milwaukee, Wis.

Crushing Rolls
C. G. Buchanan Co., New York City
Kennedy-Van Saun Mfg. & Engineering Corp., New York
McLanahan Stone Mach. Co., Hollidaysburg, Pa.
New Holland Machine Co., New Holland, Pa.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
United Iron Works, Inc., Kansas City, Mo.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.

Derricks
Clyde Iron Works Sales Co., Duluth, Minn.
McMyler Interstate Co., Cleveland, Ohio
Thomas Elevator Co., Chicago, Ill.

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co., Chicago Heights, Ill.
Marion Steam Shovel Co., Marion, Ohio
Thew Shovel Co., Lorain, Ohio

Draglines
Erie Steam Shovel Co., Erie, Pa.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, Ohio
Thew Shovel Co., Lorain, Ohio

Dragline Cableway Excavators
Browning Co., Cleveland, Ohio
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Dredge Chain
Carroll Chain Co., Columbus, Ohio

Dredges (Hydraulic)
Ellicott Machine Corp., Baltimore, Md.

Dredges (Sand and Gravel)
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Morris Machine Works, Baldwinsville, N. Y.
Thomas Elevator Co., Chicago, Ill.

Drills (Blast Hole)
Sanderson-Cyclone Drill Co., Orrville, Ohio

Drill Steel
Colonial Steel Co., Pittsburgh, Pa.

Dryers
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Process Co., New York, N. Y.
Buckeye Dryer Co., Chicago, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Kennedy-Van Saun Mfg. & Engineering Corp., New York, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Engineers
Acme Road Machinery Co., Frankfort, N. Y.
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Robt. W. Hunt Co., Chicago, Ill.
Kritzer Co., Chicago, Ill.
Mine and Smelter Supply Co., Denver, Colo.
Richard K. Meade & Co., Baltimore, Md.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
F. L. Smidth & Co., New York, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

Engines (Gasoline, Kerosene and Oil)
American Hoist & Derrick Co., St. Paul, Minn.
Climax Engineering Co., Clinton, Iowa.
Clyde Iron Works Sales Co., Duluth, Minn.

Engines (Steam)
American Hoist & Derrick Co., St. Paul, Minn.
Ellicott Machine Corp., Baltimore, Md.
Jackson & Church Co., Saginaw, Mich.
Morris Machine Works, Baldwinsville, N. Y.

Explosives (See Blasting Powder and Dynamite)

Frogs and Switches
Koppel Ind. Car & Equipment Co., Koppel, Pa.

Fuses (Detonating and Safety)
Ensign-Bickford Co., Simsbury, Conn.

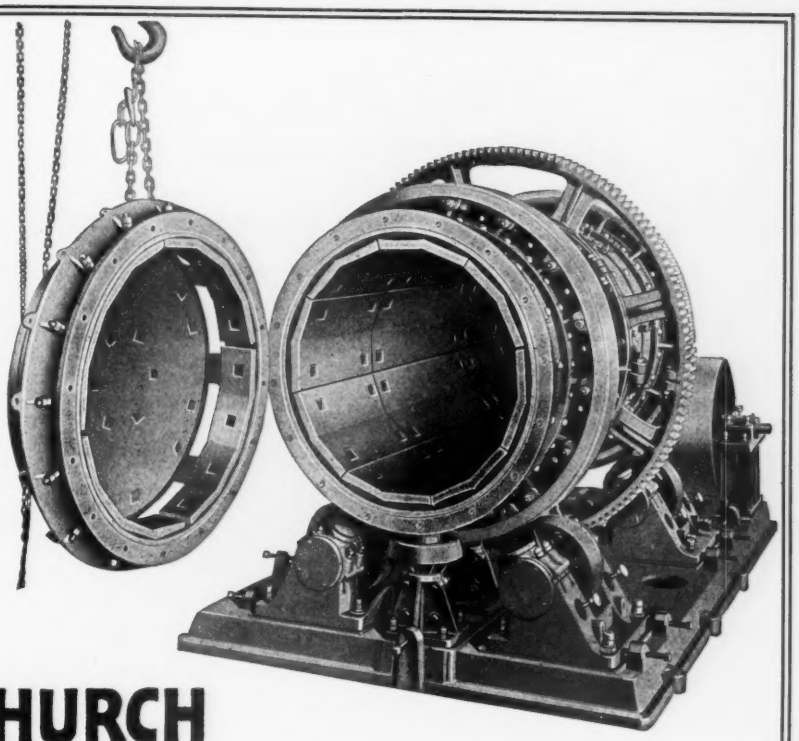
Gas Producers
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Morgan Construction Co., Worcester, Mass.

Gears (Spur, Helical, Worm)
The Falk Corp., Milwaukee, Wis. (Helical)

The Jackson and Church Rod Mill is made to grind sand where necessary and mix the sand and hydrated lime very thoroughly.

Used in conjunction with the Church Volumeter, it is capable of a large saving in labor. With the wet pan method, it would require two wet pans for two presses, which would require at least six men. While with the Rod Mill and Volumeter, the work is done mechanically, requiring but one man for operating.

Prospective operators of sand-lime brick plants should consult our engineering department.



JACKSON & CHURCH
SAND LIME BRICK MACHINERY *company* SAGINAW, MICH. U. S. A.

CORDEAU-BICKFORD
"Detonating Fuse"

Blast in an Ohio stone quarry consisting of one hundred and fifty-six well drill holes each approximately twenty-six feet deep. Cordeau-Bickford was used to detonate the explosive charge. A power line installation would be necessary to detonate this shot with electric exploders.

Cordeau-Bickford is particularly adapted for detonating a large number of explosive charges thoroughly and instantaneously.

THE ENSIGN-BICKFORD COMPANY, SIMSBURY, CONN.
Established 1836 Original Makers of Safety Fuse

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Grease
Keystone Lubricating Co., Philadelphia, Pa.

Grizzlies
Austin Mfg. Co., Chicago, Ill.
Robins Conveying Belt Co., New York City
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.

Gypsum Plaster Plants
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kans.

Hoists
American Hoist & Derrick Co., St. Paul, Minn.
Clyde Iron Works Sales Co., Duluth, Minn.
Hyman-Michaels Co., Chicago, Ill.
Industrial Works, Bay City, Mich.
Jackson & Church Co., Saginaw, Mich.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

Hose Menders
Knox Mfg. Co., Philadelphia, Pa.

Hose (Water, Steam, Air Drill)
New York Belting & Packing Co., New York City

Hydrators (Lime)
Kritzer Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Insulation (Heat)
Celite Products Co., Chicago, Ill.

Kilns (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Engineering Corp., New York City
H. Miscampbell, Duluth, Minn.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Kilns (Shaft)
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Lime Handling Equipment
H. W. Caldwell & Son, Chicago, Ill.
Kritzer Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
H. Miscampbell, Duluth, Minn.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Sturtevant Mill Co., Boston, Mass.
Webster Mfg. Co., Chicago, Ill.

Lime Kilns
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.

Loaders and Unloaders
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago, Ill.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Locomotives (Steam, Gas and Elec.)
Baldwin Loco. Wks., Phila., Pa. (Steam)
Fate-Root-Heath Co., Plymouth, Ohio (Gas)
Ironton Eng. Co., Ironton, Ohio (Elec.)
Jeffrey Mfg. Co., Columbus, Ohio (elec.)
Lima Locomotive Works, Lima, Ohio (Steam)
Milwaukee Loco. Mfg. Co., Milwaukee, Wis. (Gas)
H. K. Porter Co., Pittsburgh, Pa. (Steam)
Vulcan Iron Works, Wilkes-Barre, Pa. (Steam)

Lubricating Systems
Keystone Lubricating Co., Philadelphia, Pa.
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Magnetic Devices (Pulleys, etc.)
Dings Magnetic Separator Co., Milwaukee, Wis.

Manganese Steel (Castings, Repairs, etc.)
American Manganese Steel Co., Chicago Heights, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio

Mills, Grinding (Ball, Tube, etc.)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jackson & Church Co., Saginaw, Mich.
Mine and Smelter Supply Co., Denver, Colo.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
F. L. Smidth & Co., New York, N. Y.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Worthington Pump & Mchy. Corp., New York

Motors and Generators
Burke Electric Co., Erie, Pa.

Nipples
Knox Mfg. Co., Philadelphia, Pa.

Nozzles
Knox Mfg. Co., Philadelphia, Pa.

Oil Burners and Systems
Smokeless Oil Burner Co., Bucyrus, Ohio

Packing (Pump Valves, etc.)
New York Belting & Packing Co., New York City

Perforated Metal
Cross Engineering Co., Carbondale, Pa.
Harrington & King Perforated Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
W. Toepfer & Sons Co., Milwaukee, Wis.

Pipe (Dredge, etc.)
American Rolling Mill Co., Middletown, Ohio

Portable Conveyors
Austin-Western Road Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, Ohio
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Portable Engines
Climax Engineering Co., Clinton, Iowa

Power Units
Climax Engineering Co., Clinton, Iowa

Pulleys (Magnetic)
C. G. Buchanan Co., New York City
Dings Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.

Pulverizers
Fuller-Lehigh Co., Fullerton, Pa.
Jeffrey Mfg. Co., Columbus, Ohio
K-B Pulverizer Co., Inc., New York City
Mine and Smelter Supply Co., Denver, Colo.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Universal Crusher Co., Cedar Rapids, Iowa

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.

Pumps (Water, etc.)
Morris Machine Works, Baldwinsville, N. Y.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Smokeless Oil Burner Co., Bucyrus, Ohio
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.

Pump Valve (Rubber)
New York Belting & Packing Co., New York City

Rails
Koppel Ind. Car & Equipment Co., Koppel, Pa.

Railway Supplies
Atlas Railway Supply Co., Chicago, Ill.

Road Machinery
Acme Road Machinery Co., Frankfort, N. Y.
Austin-Western Road Machinery Co., Chicago, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Marion Steam Shovel Co., Marion, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Universal Road Mchy. Co., Kingston, N. Y.

Rod Mills
Mine and Smelter Supply Co., Denver, Colo.

Roofing and Siding Material
American Rolling Mill Co., Middletown, Ohio

Scrapers (Drag, etc.)
Austin-Western Road Machinery Co., Chicago, Ill.
Northwest Engineering Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Screens
Acme Road Machinery Co., Frankfort, N. Y.
Austin-Western Road Machinery Co., Chicago, Ill.
Earle C. Bacon Co., New York, N. Y.
Cross Engineering Co., Carbondale, Pa.
Rubert M. Gay Co., Inc., New York, N. Y.
Harrington & King Perforating Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Kennedy-Van Saun Mfg. & Engineering Corp., New York City
Link-Belt Co., Chicago, Ill.
McLanahan Stone Mach. Co., Hollidaysburg, Pa.
Newark Wire Cloth Co., Newark, N. J.
Robins Conveying Belt Co., New York City
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
W. S. Tyler Co., Cleveland, Ohio
United Iron Works, Inc., Kansas City, Mo.
Universal Crusher Co., Cedar Rapids, Iowa
Weller Mfg. Co., Chicago, Ill.

Screens (Electric Vibrating)
W. S. Tyler Co., Cleveland, Ohio

Separators (Magnetic)
C. G. Buchanan Co., New York City
Dings Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.

Shafting
H. W. Caldwell & Son, Chicago, Ill.

Shovels (Steam, Gas and Electric)
Browning Co., Cleveland, Ohio
Erie Steam Shovel Co., Erie, Pa.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, Ohio
Thew Shovel Co., Lorain, Ohio

Sprockets and Chain
American Manganese Steel Co., Chicago Heights, Ill.
H. W. Caldwell & Son Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, Ohio

Steel Plate Construction
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Hendrick Mfg. Co., Carbondale, Pa.
Jackson & Church Co., Saginaw, Mich.

Testing Sieves and Shakers
Newark Wire Cloth Co., Newark, N. J.
W. S. Tyler Co., Cleveland, Ohio

Tool Steel
Colonial Steel Co., Pittsburgh, Pa.

Track Equipment
Koppel Ind. Car & Equipment Co., Koppel, Pa.

Tramways (Aerial Wire Rope)
Interstate Equipment Corp., New York City
A. Leschen & Sons Rope Co., St. Louis, Mo.

Transmission Machinery
H. W. Caldwell & Son Co., Chicago, Ill.
Kritzer Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Underground Loaders
Thew Shovel Co., Lorain, Ohio

Valves (Throttle)
Knox Mfg. Co., Philadelphia, Pa.

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McLanahan Stone Mach. Co., Hollidaysburg, Pa
Smith Engineering Works, Milwaukee, Wis.

Weighing Equipment
Merrick Scale Co., Passaic, N. J.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Welding Equipment
Burke Electric Co., Erie, Pa.

Wheels (Car)
Koppel Ind. Car & Equipment Co., Koppel, Pa.

Winches and Capstans
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Wire Cloth
Newark Wire Cloth Co., Newark, N. J.
W. S. Tyler Co., Cleveland, Ohio

Wire Rope
A. Leschen & Sons Co., St. Louis, Mo.

PERFORATED STEEL SCREENS

You can always get a better understanding of the advantages of Cross Perforated Steel Screen if you will talk to users.

There are hundreds and hundreds of them and the service they enjoy is uniformly excellent.

500 tons or more of steel plates and sheets are carried in stock. This enables us to fill rush orders promptly.

Repair and renewal parts supplied quickly and correctly.

Write for prices and information

Cross Engineering Company, Offices and Works, Carbondale, Pa.

Locomotives of Merit

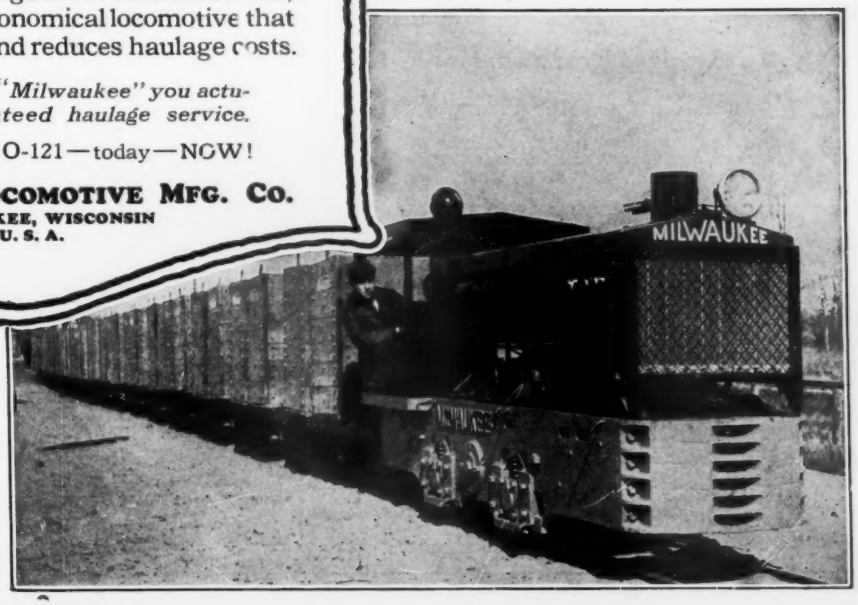
The increasing number of contractors, road builders and industrial concerns *now* using Milwaukee Gasoline Locomotives *exclusively*, merely proves that they have found in the "Milwaukee" a haulage unit of unusual merit, a dependable and economical locomotive that speeds up the jobs and reduces haulage costs.

When you buy a "Milwaukee" you actually buy guaranteed haulage service.

Write for Catalog O-121—today—NOW!

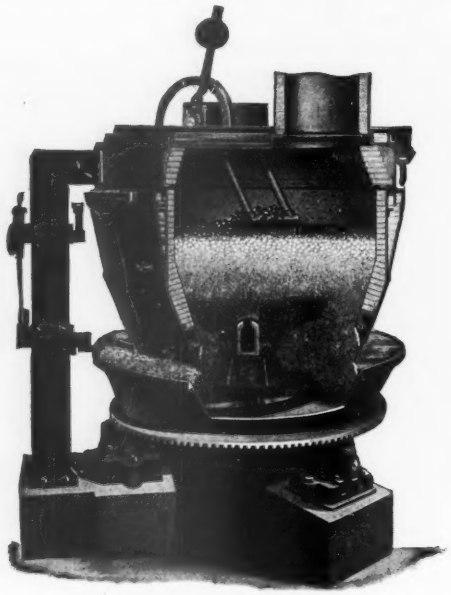
MILWAUKEE LOCOMOTIVE MFG. CO.
MILWAUKEE, WISCONSIN
U. S. A.

MILWAUKEE GASOLINE LOCOMOTIVES



You'll never know how much real value can be built into a locomotive until you learn more about the "Milwaukee."

The Machine of Absolute Satisfaction



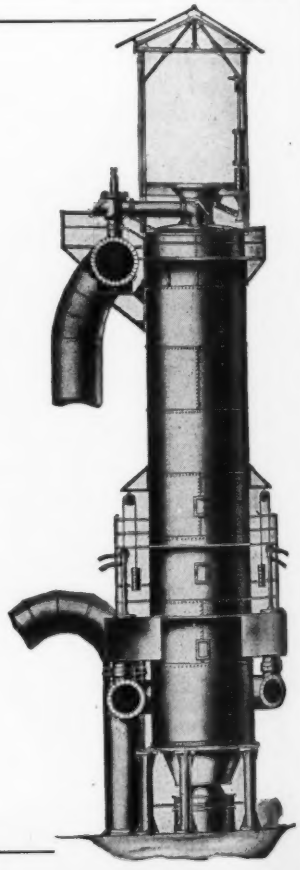
Selected by every large purchaser in the steel industry since the armistice. Three recent installations at leading Eastern Lime Plants.

POKERLESS PRODUCER-GAS MACHINE

Users everywhere testify with one voice to the superior satisfaction and low maintenance expense of this splendid machine. Difference in first cost comes back annually; every detail built for endurance.

MORGAN CONSTRUCTION CO.
Worcester, Mass.
W. D. Mount, 601 Peoples National Bank Bldg., Lynchburg, Va., Representative in the Lime Industry

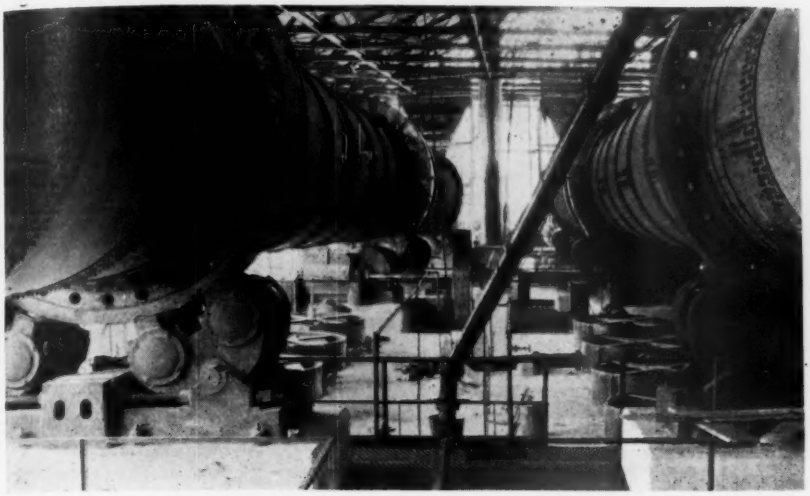
Continuous Discharge—Gas Fired
LIME KILNS



The wastefulness of efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.

Glamorgan Pipe & Foundry Company
Lynchburg, Va., U. S. A.
Using the Nationally Famous Virginia Foundry Irons



Vulcan Rotary Kilns

We have made a special study of the design and construction of the rotary kiln, concentrating our efforts on its improvement, carefully noting all valued suggestions, studying every possible improvement in design and construction, and the fact that we manufacture more kilns than any other concern in the country is our proof that they are the best and most up-to-date machine of their kind on the market today.

VULCAN IRON WORKS, Est. 1849

1753 Main Street — **Wilkes-Barre, Pa.**
New York, 50 Church Street — **Chicago, McCormick Bldg.**

OTTUMWA LOADER

When you go over your cost sheets this year carefully check up on the expense and time spent in loading your product. Then figure the cost of this machine and part time of one man to operate it. The result is bound to make you sit up and take notice.

An Ottumwa Box Car Loader at your plant means real economy in operation. It will load box cars as cheaply as open cars, having a novel and quick raising and lowering device for adjusting delivery. Can be operated by 2 or 3 h.p. gasoline engine or electric motor; replaces a whole loading gang and is always on the job ready for work.

Write for any information you may require

MANUFACTURERS
OTTUMWA BOX CAR LOADER COMPANY, OTTUMWA IOWA.
BEST BOX CAR LOADERS AND UNLOADERS

ENGINEERING SERVICE FREE

Austin Motor Rollers

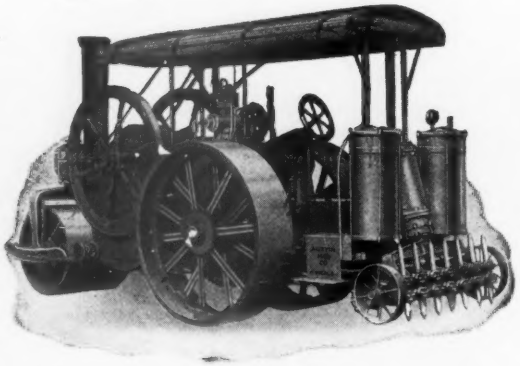
"They Serve You Right"

Everything you expect of a road roller you will find in the Austin Motor Roller to a greater degree than in any other.

Economical to operate and maintain, able to turn out more work in a given time than any other, and absolutely reliable — your first experience with one of these machines will be a revelation of REAL ROLLER SERVICE.

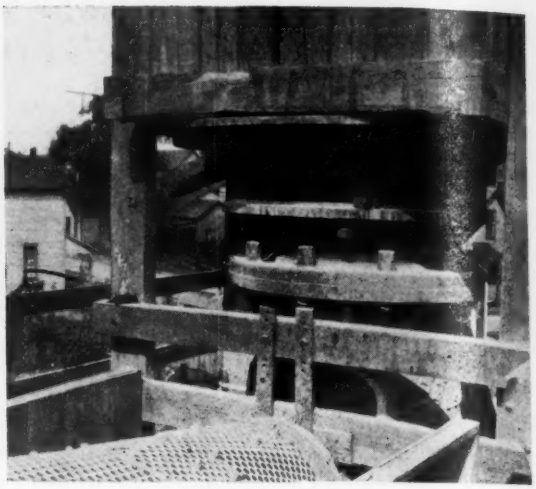
Three-wheeled rollers in two styles (single or twin engines) and five sizes (7, 8, 10, 12 and 15 ton)—there is a style and size exactly suited to your individual requirements. Pneumatic scarifier can be attached to the 10-ton and larger sizes, as shown in the photographs.

Special Catalog FT tells the whole story of Austin Motor Rollers. Write for your copy today.



THE AUSTIN-WESTERN ROAD MACHINERY CO.
CHICAGO

Branches in 22 Cities
"Everything from a Drag Scraper to a Road Roller"



No. 5
AUSTIN
Gyratory Crusher

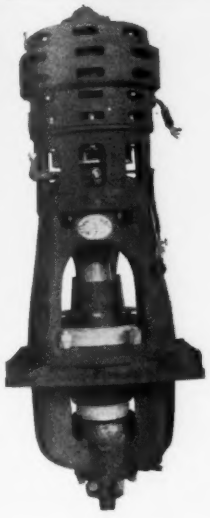
At the Plant of The Continental Clay Company, Columbus, Ohio

This Crusher is used to reduce the gravel chuted to it from the 2 in. screen to 1¼ in. and down. This profitable operation is carried on with a regularity of service that spells the difference between unbroken satisfaction and continuous annoyance.

Austin Gyratory Crushers are famous for this very kind of service. Catalog No. 29 tells the whole story of the construction and operating features that are behind it. We will gladly mail you a copy.

AUSTIN MANUFACTURING CO.
New York Chicago San Francisco

The Weston Direct Drive Gyratory Crusher for Secondary Reduction of Hard Rock, Ore and Gravel



Developed in a Granite Crushing Plant

This machine fills the need for a secondary crusher of large capacity and great strength for work in all friable rock.

The first machine, installed more than two years ago, has established remarkable records for capacity, low power consumption and general economy in operation. Later installations have more than proved all claims for the machine.

The construction is all-steel with Chrome-Vanadium forged steel shaft of large size, and with full-bearing eccentric, bronze bushed inside and out.

The entire machine is arranged to give freedom from costly delays. Positive lubrication without pumps—Dust prevention in bearings—Greater wear on manganese before replacement—Ease of adjustment and repair—and a sturdy oversize motor—All work to your advantage.

Crusher is simple in design and the best practice in modern Engineering is utilized. Built in six standard sizes to follow any primary, smallest machine can be set to ½" with large capacity.

Arranged for direct motor, or belt drive.

Bulletin No. 25-A describes this machine in detail

THE MORGAN ENGINEERING COMPANY

ALLIANCE, OHIO

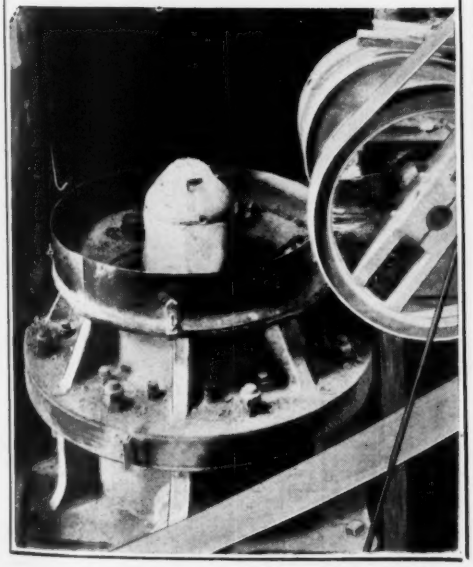
Designers, Manufacturers and Contractors
Electric Traveling Cranes, Rolling Mill Machinery
Ordnance, Steel, Shipbuilding and Forging Plants Complete
Rock Crushers, Special Machinery for Any Purpose

Chicago
122 S. Michigan Ave.

Pittsburgh
1420 Oliver Bldg.
Birmingham, Ala.
Brown-Marx Bldg.

TELSMITH RE-CRUSHER

FOR THE MAN WHO TAKES NO CHANCES



There are plenty of risks in the quarry and gravel field without taking UNNECESSARY chances. That's why we recommend the Telsmith Reduction Crusher, as a measure of relief to the long-suffering quarry and gravel pit operator.

It's the one machine that will take a gravity feed of coarse rock. It's the only re-crusher that you can cover up with rock—five, ten, twenty feet deep—with absolute assurance that it will "come through clean," cool as a cucumber, tight as a fiddle and merry as Old King Cole. While it's not absolutely fool-proof, the main parts (shaft, frame and crown) are guaranteed against breakage for two years, tramp iron included. With an enormous discharge diameter, huge bearings, force feed lubrication, a big oil reserve and perfect control of the oil supply, this machine romps through a day's work as though heavy duty crushing were no job at all.

Glad to send you Bulletin No. 2F11 (Telsmith Reduction Crusher) and Catalog No. 166 (Telsmith Primary Breaker).

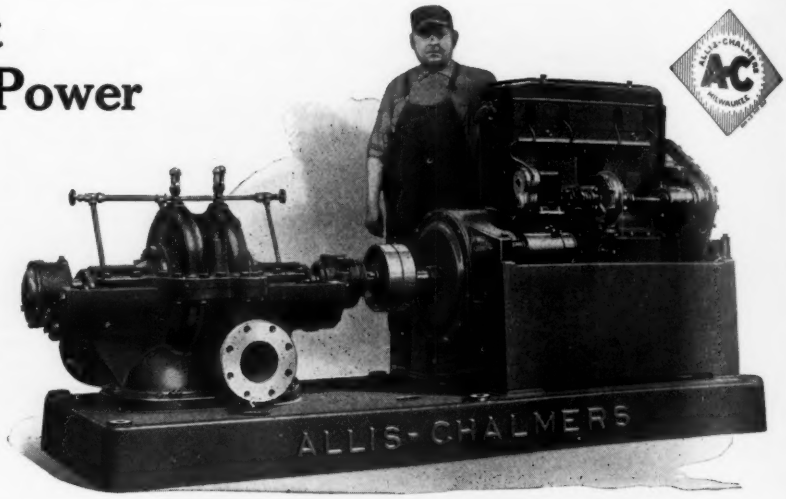
SMITH ENGINEERING WORKS

3188 Locust Street Milwaukee, Wis., U. S. A.

Canadian Representatives:
Canadian Ingersoll-Rand Co., Montreal, P. Q.

If you haven't Electric Power

A gasoline engine driven pump will take care of your pumping requirements. They can be used for gravel washing, sluicing and supplying water for steam shovels in the Rock Products industries or for fire pumps, tank pumps and general supply pumps anywhere. Our Bulletin 1632-F describes other applications.

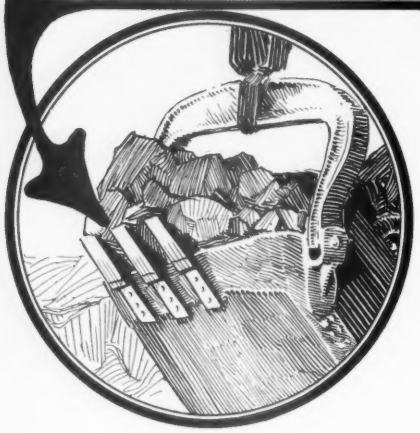


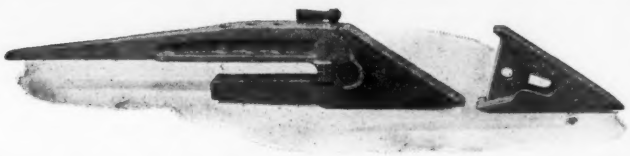
Bulletin 1632-F Sent on Request

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

AMSCO CLARK REVERSIBLE DIPPER TEETH





A heavy duty two part tooth designed to meet the most severe digging conditions. Particular attention is directed to the wedge type bolt entering through the side, which not only provides an easy means for renewing or reversing the point but also when drawn up keeps the point tight on the base.

The tooth is constructed so that there is no shear on the bolt and side lugs provided on the point overcome the tendency of the base to spread, eliminating the effect of side thrust.

It will pay you to investigate our exchange proposition on Clark Reversible Dipper Teeth

AMSCO

"The Steel for Service"

American Manganese Steel Co.

General Sales Office

398 East 14th Street Chicago Heights, Illinois

Foundries: Chicago Heights, Ill.; New Castle, Del., and Oakland, Cal.

FALK
HERRINGBONE GEARS

Falk Herringbone Ball Mill Gears—17 and 267 teeth; 2 D. P., 16 inch face

Smooth Power Transmission

Falk Herringbone Gears are the ideal equipment for gearing down high speed motors to the speed of the driven machinery. They are being widely used on grinding and pulverizing machinery, such as tube mills, ball mills, conical mills, etc., and on hoists, compressors and centrifugal pumps.

By eliminating vibration and reducing power loss to an absolute minimum, they afford the highest overall mechanical efficiency which it is possible to attain in transmitting power.

Our engineering department will be glad to consult with you on your particular problems.

The Falk Corporation
MILWAUKEE, WISCONSIN

REPRESENTATIVES:

W. O. Beyer, 1007 Park Bldg., Pittsburgh, Pa.
M. P. Fillingham, 50 Church St., New York City.
General Machinery Co., Brown Marx Bldg., Birmingham, Ala.
Vulcan Iron Works, Wilkes-Barre, Pa.
Mine & Smelter Supply Co., Denver, Salt Lake and El Paso
Engineering Equipment Co., Ltd., 358 Beaver Hall Sq., Montreal, Quebec, Canada.

FOREIGN REPRESENTATIVES: Gustav Melms, 3 Rue Taitbout, Paris

Don't Let Little Things Stop BIG THINGS

KNOX Sectional Clamps

If you have installed an expensive centrifugal pump, uninterrupted service means economy.

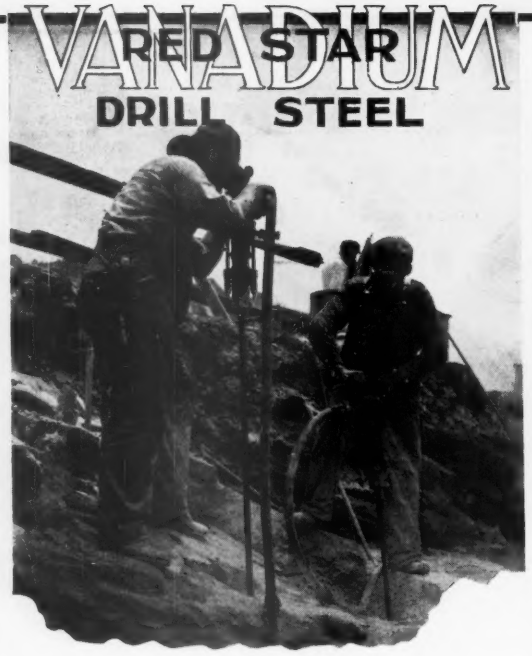
Don't let your pipe line go back on you.

Fasten the rubber-sleeves with

KNOX Sectional Clamps
Sizes 4⅜ to 29″

KNOX
Valves-Couplings-Nipples-Clamps-Menders

Knox Manufacturing Company
821 Cherry St., Philadelphia, Pa.



For Rock Cutting

VANADIUM, the master alloy for Tool Steel used in metal cutting, has proved the master alloy for Drill Steel used in rock cutting.

Vanadium makes steel tougher, stronger, more enduring. That is why, as long service records show, Red Star Vanadium Drill Steel cuts faster, holds its edge and its gauge longer, and materially reduces drill bit breakage.

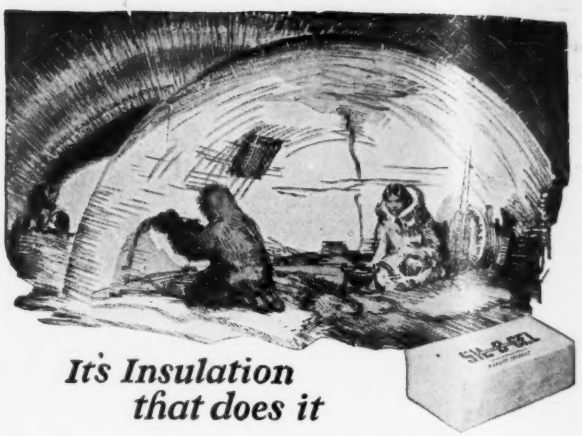
There is economy for you in the use of Red Star Vanadium. Also it will prove a direct means to greater production. Ample proof of its high worth will be demonstrated in the results produced by your first lot of Red Star Vanadium.

The nearest Colonial Warehouse will fulfill your immediate requirements.

Colonial Steel Company

Pittsburgh · **Cleveland** · **Denver**
New Haven · **Cincinnati** · **Salt Lake City**
Boston · **Detroit** · **Wallace, Idaho**
New York · **Chicago** · **Phoenix**
St. Louis

Edw. L. Soule Co., San Francisco



It's Insulation that does it

A TINY FLAME keeps the Eskimo's igloo warm and comfortable, despite the fact that the outside temperature may be many degrees below zero.

It's insulation that does it. Millions of microscopic air cells formed between the particles of tightly packed snow break up heat penetration and hold it within the hut. Large air spaces are not as effective, as the U. S. Bureau of Standards have decisively proved, and the perfect heat insulation only needs in addition to its countless minute air cells, a composition which withstands high temperatures, and sufficient structural strength.

All these requirements are found in SIL-O-CEL Heat Insulation—in world-wide service on all types of high temperature equipment. Tests by the Bureau of Standards prove it to possess a lower heat conductivity than any other insulation suitable for high temperatures. Furnished in forms which withstand without shrinkage, direct heats of 2000° F., SIL-O-CEL has ample structural strength, is easily applied and permanently effective.

A type for application to boilers, furnaces, ovens, kilns and similar heated units without change in design — Brick, C-22, Block, C-3, Powder, Cement.

Write nearest office for complete information given in Bulletin S-95, or mail the coupon.

A CORRECTION

The crushing strength of SIL-O-CEL Insulating Brick was incorrectly reported in last month's advertisement as being 400 lbs. per square foot. This should read "400 lbs. per square *inch*" or 28 tons per square foot.

CELITE PRODUCTS COMPANY

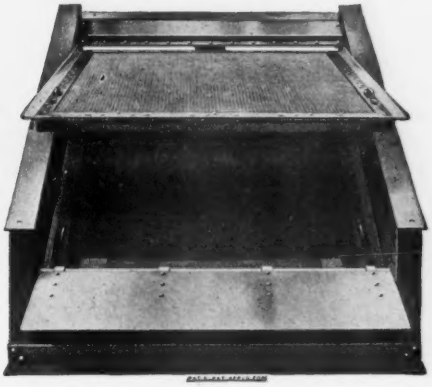
New York-11 Broadway Chicago-53 W. Jackson Blvd. San Francisco-Monadnock Bldg.
Offices and Warehouses in Principal Cities
CELITE PRODUCTS LIMITED, New Birks Bldg., Montreal, Canada
CELITE PRODUCTS CORPORATION, Windsor House, London, S.W.1., England

CELITE PRODUCTS COMPANY—
Gentlemen: Send blueprints and Bulletin S-95 on SIL-O-CEL
Heat Insulation for _____
(Give type of equipment)
Name _____
Company _____
Address _____

Heavy Duty Moto-Vibro Screen

FOR
SAND, GRAVEL,
CRUSHED STONE,
ETC.

Coarse or Fine
1 to 3 Products



WET, DRY, DAMP
(within reasonable limits)

ASTONISHING
CAPACITIES

ACCURATE
OUTPUTS

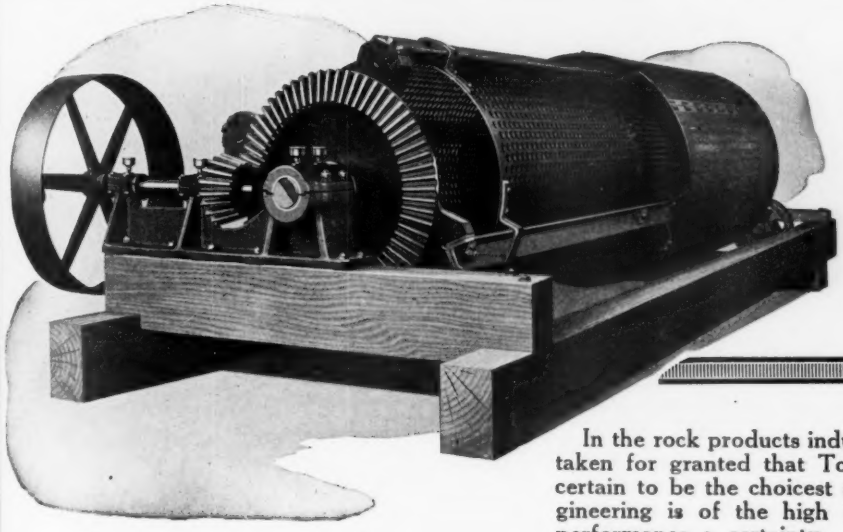
INEXPENSIVE

SCREEN FRAMES CHANGED IN 5 MINUTES—NO SPECIAL CLOTH

Intense vibration separates adhering sand from pebbles, breaks up sand "mats," prevents building on wire, wedging, and keeps meshes open.

Motor or belt driven, no auxiliaries. Simple, durable, accessible.

STURTEVANT MILL CO. HARRISON SQUARE Boston, Mass.



The Toepfer Screen

In the rock products industry it is almost universally taken for granted that Toepfer materials are always certain to be the choicest and best—that Toepfer engineering is of the high type that renders superior performance a certainty.

Toepfer screens are heavy. The head ring at the receiving end is cast steel, running on chilled rollers. The gear head and main bearing are cast in one piece.

Made in a size to meet your requirements.

We Also Manufacture:

Elevators, Sand Washers, Washing Screens, Grizzlys, Feeders, Conveyors, Bin Gates, Perforated Metals.

W. Toepfer & Sons Co., Milwaukee, Wisconsin

WELLER-MADE EQUIPMENT

For Handling the Materials Mechanically

Increase the Output and Reduce Costs by Employing Weller-Made Machinery to Do the Work

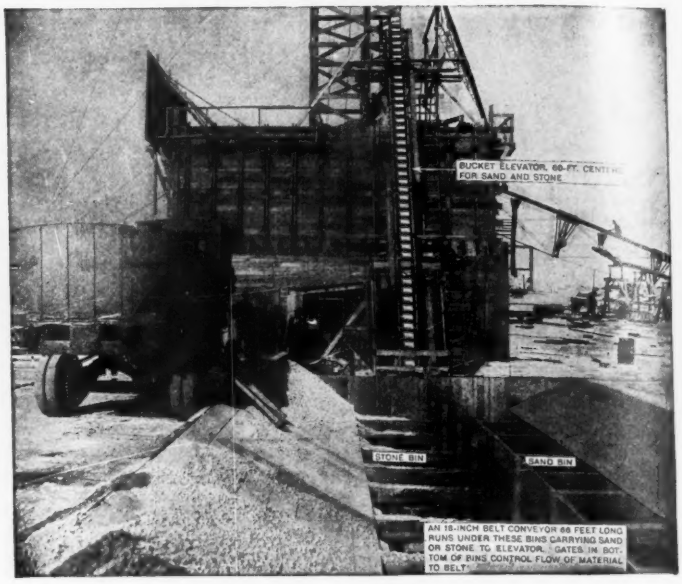
It is sturdy and reliable. Never lays down on the job. The cost of operation is small. Will help pay dividends.

We Make
Conveyors of All Types

Bucket Elevators	Portable Elevators
Steel Storage Bins	Bin Gates
Screens	Sheet Metalwork, etc.

WELLER MADE CHICAGO

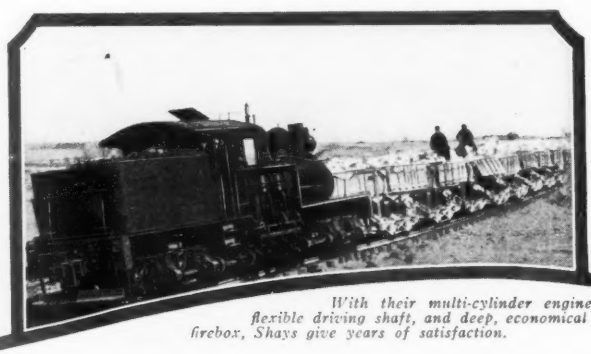
Write and let us know the kind of equipment you are interested in or the material you want to handle. Catalogues showing installations, also data to help in selection of equipment, will be sent.


BUCKET ELEVATOR, 60-FT. CENTERS FOR SAND AND STONE
STONE BIN
SAND BIN
AN 18-INCH BELT CONVEYOR 60 FEET LONG RUNS UNDER THESE BINS CARRYING SAND OR STONE TO ELEVATOR. GATES IN BOTTOM OF BINS CONTROL FLOW OF MATERIAL TO BELT

WELLER MFG. CO.

1820-1856 North Kostner Avenue — SALES OFFICES — Chicago, Illinois

New York · Boston · Baltimore · Pittsburgh · Cleveland · San Francisco · Salt Lake City



With their multi-cylinder engine, flexible driving shaft, and deep, economical firebox, Shays give years of satisfaction.

"PERFECTLY SATISFACTORY IN EVERY WAY"

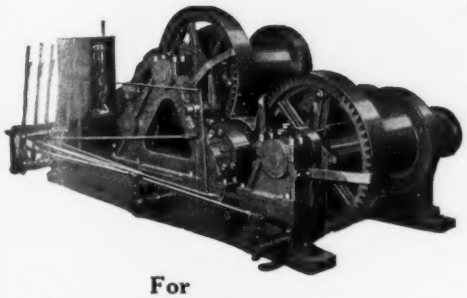
OUR Shay Geared Locomotives have been in operation for seventeen years and we have found them perfectly satisfactory in every way. None but a Shay would have given the satisfaction we have enjoyed."

Shay design and construction insure years and years of continuous, low-cost service.

Let us explain how this design and construction are adapted to your hauling requirements.

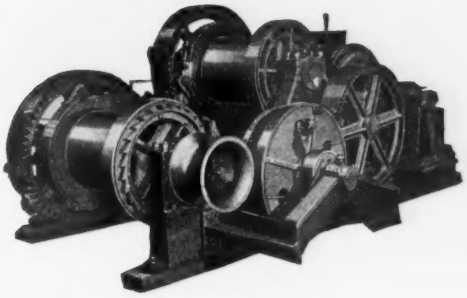
LIMA LOCOMOTIVE WORKS, Incorporated
17 East 42nd Street, New York — Lima, Ohio

THOMAS HOISTS



Single and Two Speed Types

Designed and built for every requirement of the Sand, Gravel and Stone Producer



For

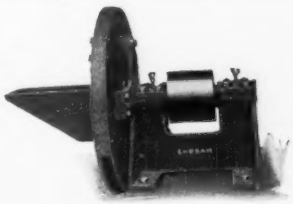
Dragline Cableways
Drag Scrapers
Derricks
Bucket Operation
Car Haulage

Ask for Bulletin No. 33

Builders of Hoists for Over Thirty Years

THOMAS ELEVATOR COMPANY

27 South Hoyne Avenue **Chicago, Ill.**



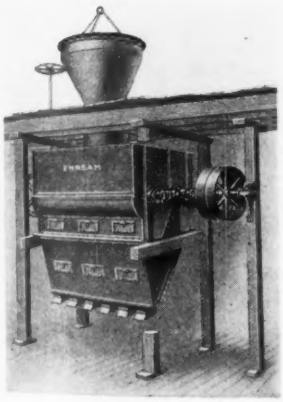
Hair Picker

EHRSAM Machinery

Ehrsam Hair Pickers are a necessary equipment for wall plaster plants. They are perfect in design and construction, being the recognized standard for this type of machine.

Ehrsam Mixers are made for mixing plaster fibre and retarder, or any dry powdered substance, and are made either single or double barrel with capacities up to 2000 pounds per charge. They can be furnished with sacking chamber and spouts for hand sacking or can be arranged for attaching Bates Valve Baggers.

Like all Ehrsam products they are built to stand up and give an uninterrupted service performance.



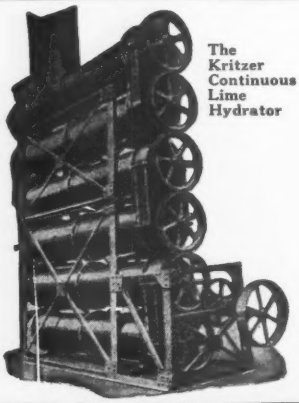
Double Barrel Mixer with Sacking Hopper

The J. B. Ehrsam & Sons Mfg. Company
Enterprise, Kansas
John J. Abramson, Western Sales Representative
612 San Fernando Building, Los Angeles, Calif.

Keep up with the Rock Products Industry

TIME and money are saved and won by keeping up with the progress of industry. Changing conditions, methods, prices must be reckoned with to win success. **Rock Products** is the authoritative source of business and technical information in the rock products industry. It is edited from the field by experienced practical men.

Subscribe now and get in correspondence with our service and advisory departments.



The Kritzer Continuous Lime Hydrator

HYDRATE

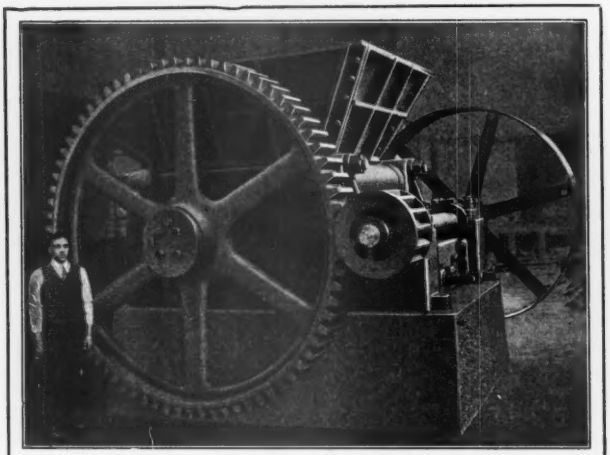
Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY

503 South Jefferson Street CHICAGO, ILL.



If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

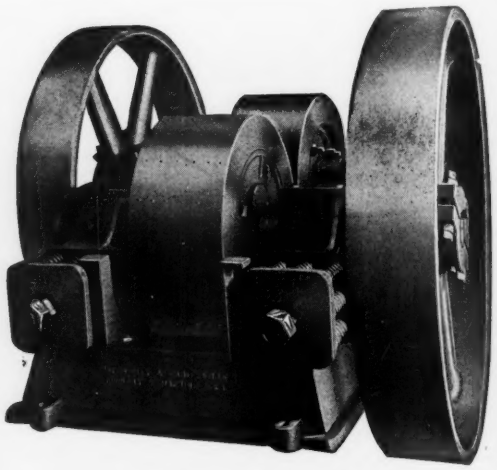
After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.

Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.



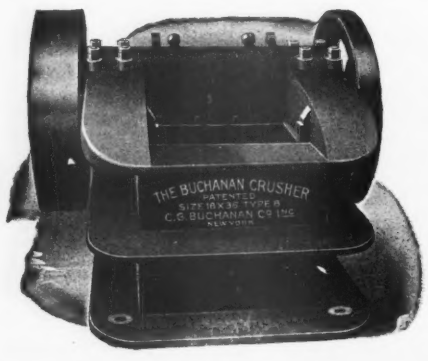
CRUSHERS—

Webb City & Carterville crushers, screens, elevator buckets, or transmission equipment have conspicuously demonstrated their superiority wherever they have been installed.

Write for Descriptive Circular

WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS

WEBB CITY, MISSOURI



BUCHANAN ALL-STEEL CRUSHER

Type "B" Jaw Crusher

Frame is a solid casting of open-hearth steel in one piece having a tensile strength of from 60,000 to 65,000 lb. per square inch, three or four times stronger than cast iron and with at least three or four times the rigidity of the built-up rolled steel-plate crusher.

Jaw and Cheek Plates are of the best Manganese Steel, made reversible for double wear—Adjustable Jaw Stroke—Shim Adjustment—Safety Toggle—Reversible Steel Toggle Seats—Phosphor Bronze Frame Bearings (in smaller sizes)—Steel Swing Jaw and Pitman—Pitman water jacketed and parting in large sizes.

Built in sizes up to 18"x36".

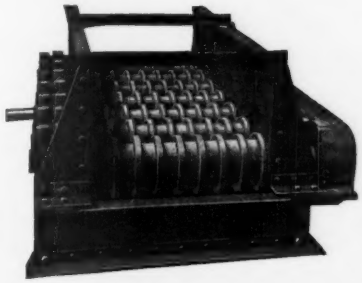
Large Crushers, Crushing Rolls, Complete Crushing Plants

Write for Bulletin No. 9

C. G. BUCHANAN COMPANY, Inc.

Cedar and West Streets, New York City

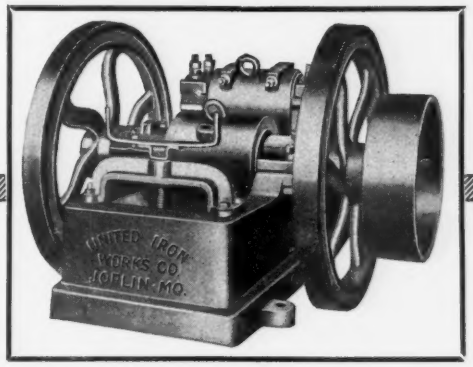
ROBINS
Cataract Grizzly
For a Perfectly Sized Product



It is ruggedly constructed; occupies small space; takes but little power; gives a clean product. Machines built to handle up to 1,000 tons per hour and to make any desired separation between 1 inch and 6 inches.

Write for Bulletin No. 60

Robins Conveying Belt Company
New York Chicago Pittsburgh Boston



The "United" Crusher

The wearing parts of the "United" Blake Type Jaw Crusher are made from a special semi-steel mixture, the wearing qualities of which approach that of steel at a fractional cost.

These crushers are furnished in eight sizes, openings from 7x10" to 12x24" with capacities from 6 to 35 tons per hour.

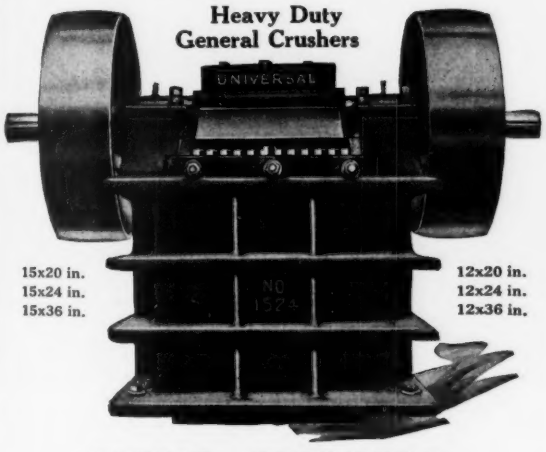
We guarantee prompt shipments of any repair part required.

Send for Special Bulletin

UNITED IRON WORKS, Inc.
General Offices, Kansas City, Mo.

"UNITED" IRON WORKS INC. FOR SERVICE

Heavy Duty General Crushers



15x20 in.
15x24 in.
15x36 in.

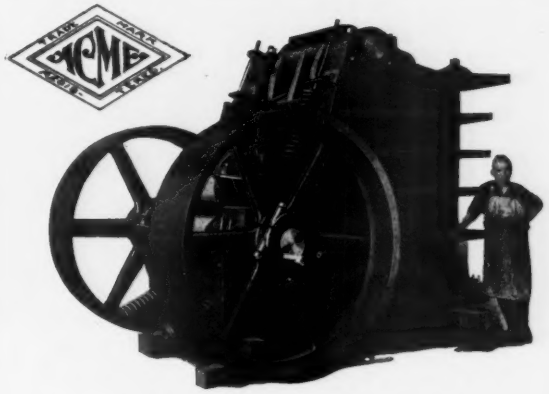
12x20 in.
12x24 in.
12x36 in.

YOUR CRUSHER
should be ***strong, durable*** and ***dependable***

OUR STEEL CRUSHERS
are all of that and more. Let us tell you how. Capacities 5 to 450 tons per day. Stationary or Portable.

Write for circular and prices

UNIVERSAL CRUSHER COMPANY
225 Third Street Cedar Rapids, Iowa



Acme Steel Crushers
6x10 to 42x48

We have in stock for immediate delivery sizes up to 30x36, one piece frame, and up to 26x40, four piece frame.

Diecast Genuine Removable Bearings

Complete Quarry Equipment
Write for Catalogue 12-B

Acme Road Machinery Company
Main Office and Factory
Frankfort, N. Y., U. S. A.

GAYCO

CENTRIFUGAL SEPARATOR

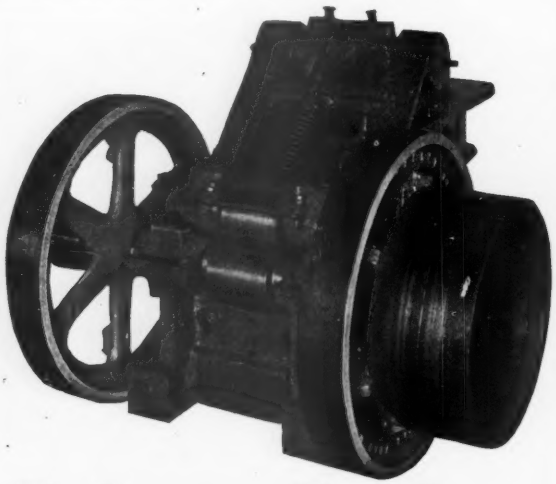
A Dependable "AIR-SCREEN" for sizing

Fibrous, Flaky or Granular Materials

Write Us for Particulars

60 mesh to 350 mesh

RUBERT M. GAY COMPANY, Inc. 114 Liberty St., New York, N. Y.



Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

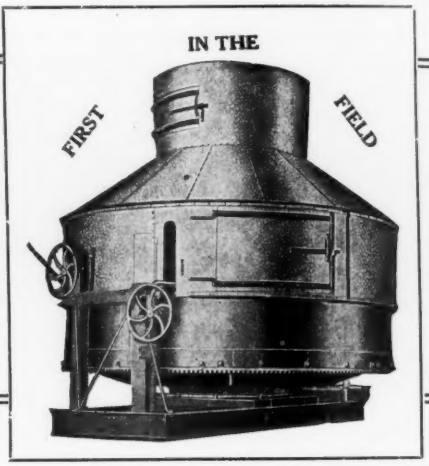
Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.

Branches in all principal cities in U. S. and Canada

MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

The CLYDE Hydrator



Even if we did not call attention to the economy in cost of installation, maintenance and operation, the fact that the Clyde produces 90% of the hydrate of America should be worth considering.

H. MISCAMPELL

Patentee and Sole Manufacturer

DULUTH Patented Nov. 29, 1921 Serial No. 1398238 MINNESOTA

Fig. 283. Sand and Gravel Dredge

Send for Bulletin 2094

HYDRAULIC DREDGES
SAND and GRAVEL DREDGES
DREDGING PUMPS and MACHINERY

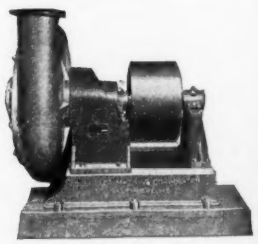
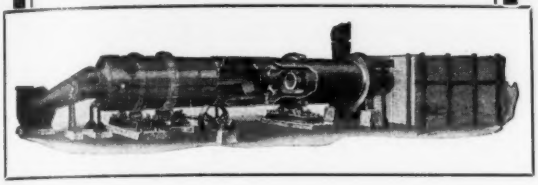


Fig. 280. Dredging Pump

Send for Bulletin 2084

Ellicott Machine Corporation, Baltimore, Maryland, U. S. A.

THE BUCKEYE DRYERS



This is the Buckeye Type B Dryer which the British Columbia Cement Co. are using for drying 12 tons of coal per hour at a fuel cost of 21 pounds of coal per ton of dried coal. Using no dust collectors. They say it is the best dryer they have ever seen for drying coal.

The BUCKEYE DRYER COMPANY
131 West Lake Street, Chicago, Ill.

Flirting With the Shovels

In the game of crushed stone quarrying a drill that is within flirting distance with steam shovel or the loading gangs is in a dangerous position. A breakdown on the drill, and the whole production schedule is upset.

No. 14 Cyclone Drills, on the job, always keep plenty of stone ahead, and if they should ever be crowded there is no need for worry—the working parts are cast steel, reducing to the very minimum all possibility of breakdowns.

Write for "Big Blast Hole Drills," a semi-technical treatise on quarry drilling and also containing a complete description of Cyclone No. 14 Big Blast Hole Drills.

The Sanderson-Cyclone Drill Co.
Orrville, Ohio
Eastern and Export Office: 30 Church Street, New York City

OSGOOD 29 Cutting a Clean Path in a Stone Quarry

Labor and Modern Machinery

Much is being said these days about the shortage of man power. Perhaps the shortage may become acute, but modern mechanical equipment will take the place of many laborers on many kinds of work. OSGOOD STEAM SHOVELS are a good example. It will pay you to find out what an OSGOOD will do.

¾, 1, 1¼ yd. Revolving Steam Shovels, Clamshells, Draglines and Cranes
1½ to 6 yd. Railroad Type Steam Shovels

Information on request.

The OSGOOD Company
MARION, OHIO, U. S. A.

RUSTON EXCAVATORS

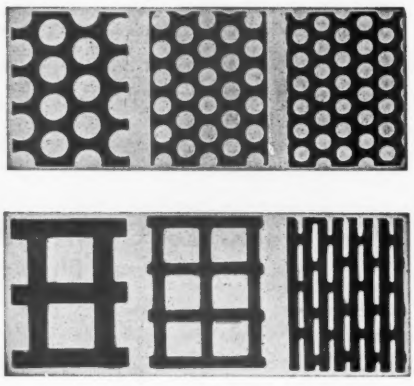
Made by the oldest established firm of Excavator Makers in the world (first machine built in 1875). The employees number nearly 8,000. We build **Full Circle Shovels** from **17 to 300 tons** in weight.

Railroad Type Shovels up to **100 tons**, of thoroughly sound and up-to-date design.

Send us particulars of your requirements. We will quote you for a machine or machines either for cover or rock.

RUSTON & HORNSBY, LTD.
Lincoln, England

Perforated Steel Screens



For Screening Stone, Gravel, Sand and Cement

All sizes and shapes of holes in metal of proper thicknesses to give the best screening results.

Sheets furnished flat or rolled to shape for revolving screens.

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5650 Fillmore St., Chicago, Ill.

NEW YORK OFFICE: 114 Liberty St.

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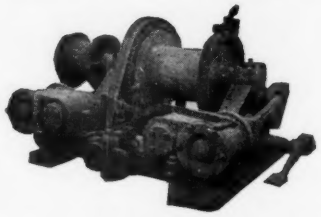

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UNUSED

DOUBLE CYLINDER, SINGLE DRUM, IN FIRST CLASS CONDITION

$125.00 Each F. O. B. Chicago

Capacity, 10,000 Pounds—IMMEDIATE SHIPMENT

Detailed Specifications Furnished on Application

"QUANTITY IS LIMITED"

Relaying Rails and Angle Bars

All Weights and Tonnages for Prompt Shipment

Get Our Quotations

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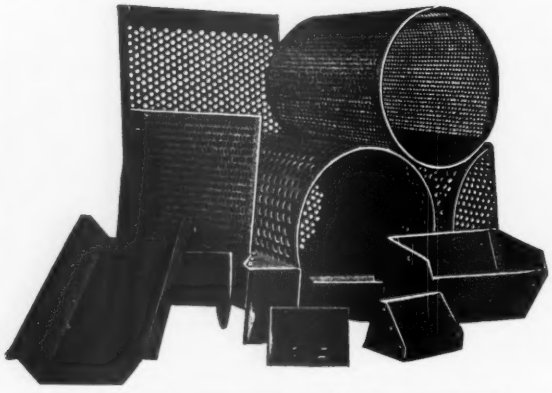
Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.



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General Sheet and Light Structural Work

"Light and Heavy Steel Plate Construction"

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CARBONDALE, PA.

New York Office, 30 Church Street
Pittsburgh Office, 544 Union Trust Bldg.
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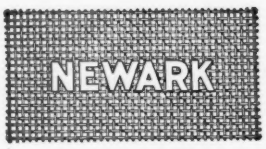

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"NEWARK" Wire Cloth

This cloth is uniform in mesh, therefore producing a uniform product.

The quality of the wire is always the best, assuring the greatest economy.

Screens are made in all metals and in all meshes from 2-in. space to .0017-in. space.

Testing Sieves
U. S. S. Screen Scale

NEWARK WIRE CLOTH CO.

Newark, New Jersey

Sullivan Granite Co., Westerly, R. I., Use Their

Industrial Crane

for Stripping Overburden — Handling Huge Granite Blocks from Quarry to Cars

Mr. Frank A. Sullivan, President, advises, "Six laborers at $4.00 per day makes a total yearly cost of $7,200.00. Very little can be accomplished in a quarry with six men, but this $7,200.00 covers all cost of operating, including operator, interest on investment and depreciation of our crane, which does many times the work of six men, and also work impossible to do in any other way. We have found our INDUSTRIAL to be a very profitable investment and a great labor saver."

Let us send you our Golden Anniversary catalog

Industrial Works, Bay City, Michigan

New York Chicago Philadelphia Detroit

1873 SALES ENGINEERS IN ALL PRINCIPAL CITIES BUILDERS OF CRANES FOR 50 YEARS 1923

Oldest and Largest Manufacturers of Cranes in the Country
17 Different Types, Capacities 5 to 200 Tons

MORE GRAVEL; less cost

Even the smallest ERIE often gives an output of 500 tons a day, or even more under favorable conditions.

P. Cogger, Lowell, Mass., owner of the 13-ton ERIE shown above, writes:

"I would not have believed that we could do the work that this 'A' ERIE actually handles. It has given 50 per cent more than I expected. Besides, we have dug frozen sand and rock, without a thing going wrong with the machine."

Whether you need an output of 200 tons a day or 1,000 tons, you will be interested in a bulletin that shows just what ERIE Shovels can do for you. Write for Bulletin P-16.

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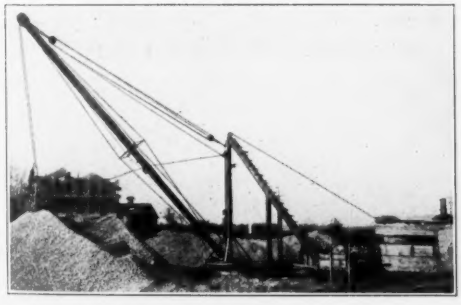
ERIE STEAM SHOVEL CO., Erie, Pa., U.S.A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels



Unloaded 14 Gondola Cars in 10 Hours

Hanlon & Oakes of St. Paul, Minn., unloaded 14 cars of crushed rock in 10 hours with an "AMERICAN" Stiffleg Derrick and a 3 drum 8¼x10 Hoisting Engine, with an "AMERICAN" Independent Slewing Engine to swing the boom. This performance becomes quite remarkable when we consider the fact that the bucket had to travel 200 feet from car to pile and back.

Your profits depend on your handling costs. Why pay out for operating expenses money that you might just as well put in the bank?

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minn.
New York - Chicago - Pittsburgh - Seattle - New Orleans - Detroit

An Ironton handling rock cars in a limestone quarry

Economical haulage, as applied to your special conditions, is assured by a thorough survey from our Sales Engineers. There is no obligation on your part if you allow us to submit facts and figures concerning your particular problem. We will not recommend an IRONTON Storage Battery locomotive unless we know it will produce satisfactory results.

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STORAGE BATTERY LOCOMOTIVE

THE IRONTON ENGINE COMPANY
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Branch Offices:

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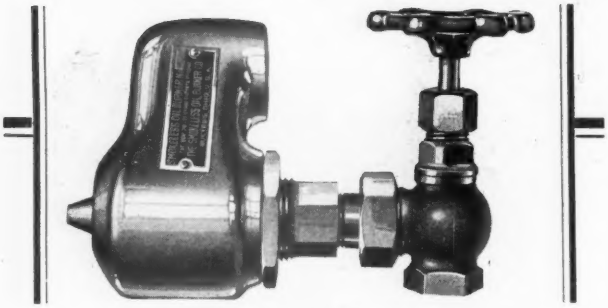

Install

THE SMOKELESS OIL BURNER

Install it because it atomizes every drop of fuel, assuring complete combustion. Install it because it is the ideal burner for boilers, dryers, and all steam equipment where oil can be used as fuel.

Our engineers will investigate your proposition and it can be installed at slight expense.

TANKS—PUMPS—METERS—STRAINERS

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Bucyrus, Ohio
St. Louis Office, 2140 Railway Exchange Building

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SMOOTH running; correct in design, accurate and true to pitch, Caldwell gears are bound to please you. We make all types—machine-molded, cut tooth, mortise gears, worm gears, etc. Learn more about Caldwell-Link-Belt Service.

Let us figure with you next time you are in the market.

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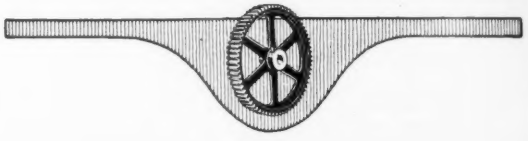
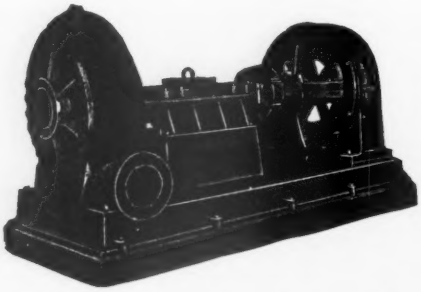
CALDWELL





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Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4 in. up, arranged for belt, motor, or engine drive.

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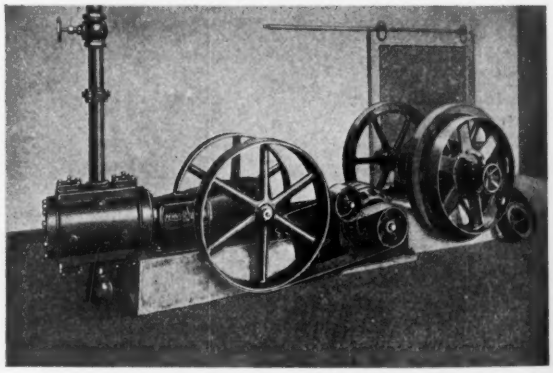
Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

PENNSYLVANIA
AIR COMPRESSORS and PUMPS



Operating dependability, durability and economy assure the greatest degree of satisfaction to users of the Pennsylvania.

The engraving above illustrates a compressor driven by motor, with oil engine for emergency service.

Our nearest branch will forward descriptive literature on request.

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BULL BEARING ALLOY

"Better than Babbitt"

Ajax Bull Bearing Alloy in your crusher bearings prevents frequent re-babbitting and is a safeguard against costly breakdowns. We'll prove it.

Send for circular A and our offer.

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Established 1880

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Prevents Shut-downs!

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FREE

Write, on your letterhead, for free booklet on magnetic separation in quarries.

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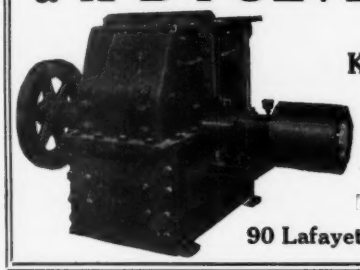
See 'phone book for branches in all large cities

HIGH DUTY Magnetic Separators

On a cost-per-ton-of-output basis your next crushing unit must be

a K-B PULVERIZER

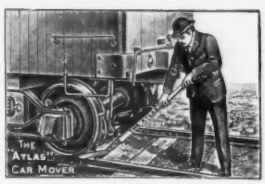


All-Steel Kant Break

K-B Pulverizer Corporation

90 Lafayette St., New York

ATLAS CAR MOVER



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They save time and money. You cannot afford to be without a few.

State what style rail to be used on. We will then know what style to send you.

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New Holland Rock Crushers will crush oversize from gravel banks or from larger crushing plants into finer grades, thus securing highest prices. They are durable and inexpensive and run on small power with little attention. Built in sizes from 2 to 15 tons per hour, requiring 5 to 15 h.p. to operate.

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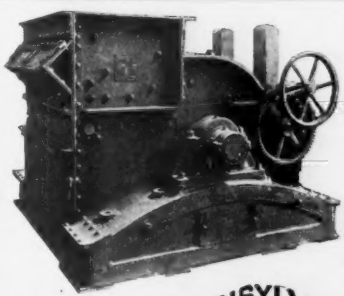
Manufactured by

New Holland Machine Co., New Holland, Pa., U. S. A.



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for Limestone, Cement Rock, Shale, Lime, etc.

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One prepared for winter while the other sang. If winter conditions interfere with your haulage why not have us prepare you? Write for details about

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SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

FULLER PRODUCTS
Insure Fullest Satisfaction

Crushing Rolls.
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Sprockets, Traction Wheels, and Roll Heads.
All kinds of High Grade Chilled Charcoal Iron Castings for All Uses.

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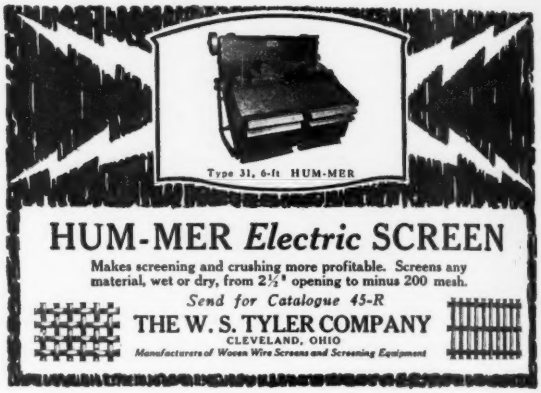

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Makes screening and crushing more profitable. Screens any material, wet or dry, from 2½" opening to minus 200 mesh.

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CEMENT MAKING MACHINERY
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They Insure Full Power Transmission
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They Make Good Belts give Better Service
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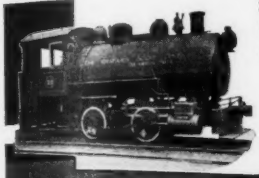
Uninterrupted Chain Service!

There, Is Your Economy and Increased Production

"Carroll" Solid Weld Chains wear out, but they do not break or pull out at the welds

THE CARROLL CHAIN COMPANY
COLUMBUS OHIO

PORTER



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H. K. PORTER COMPANY
Union Bank Bldg.
Pittsburgh, Penna.

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Bertha Coal

Is used extensively by many of the large companies which have made the CEMENT AND ROCK PRODUCT INDUSTRIES famous throughout the world.

If YOU desire a Dependable Source of Coal Supply, backed up by Courteous and Efficient Service, we shall be pleased, upon inquiry, to direct you to some of our patrons for reference as to the Quality and Preparation of Bertha Coal.

Our mines are located in Ten of the Choicest Bituminous Districts of Pennsylvania, Ohio, West Virginia and Kentucky and we are in a position to ship Quality Coal to all points East of the Mississippi River. We solicit your inquiries.

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OF PITTSBURGH, PA.
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Auto-Crane

Its ability to do effective work in limited quarters is just one of its recommendations. Furnished with mounting and power to suit purchaser. Takes all standard attachments.

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Also builders of Full-Circle Cranes, Truckranes, Buckets, Hoists, etc.

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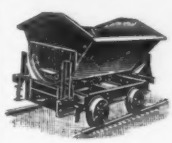
THE STANDARD OF EXCELLENCE

BALDWIN
Industrial and Contractors' LOCOMOTIVES

are in use where dependable motive power is required.

Full information upon request

The Baldwin Locomotive Works
PHILADELPHIA



Industrial Cars and Dumping Buckets of All Kinds

Specialize in

Hoppers, Bins, Bin Gates, Chutes

Penn Foundry & Manufacturing Company
Hillcrest, Reading, Pa.

Electric Motors and Generators
for all requirements of the Rock Products Industry

BURKE ELECTRIC CO.
Main Office and Works
Erie, Penna.

Service Sales Offices
Buffalo, New York — Cleveland, Philadelphia — Detroit, Pittsburgh

Sales Agencies
Underwood Electric Co., Cincinnati
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Weigh While in Transit Over
THE MERRICK CONVEYOR WEIGHTOMETER
An Automatic—Continuous—Accurate Record

Any material which is conveyor-handled can be weighed without additional handling or loss of time by the Merrick Conveyor Weightometer.

Scales guaranteed and proven better than 99% accurate.

Shipped as a complete unit. Fits any conveyor. Simple to install.

MERRICK SCALE MFG. COMPANY
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FOR SALE

1—Horizontal "Hoosier" 10x12 Steam Engine—rated 40 HP.
Complete outfit for 1-in. manila rope drive consisting of 1—36-in. sheave, 3 grooves; 1—48-in. sheave, 3 grooves; 1—48-in. sheave, 1 groove; 1—36-in. double yoke four wheel horizontal tension carriage.
1—Dean Brothers' horizontal, durable, duplex, double-acting brass-fitted piston type pump, having
8-in. steam cylinders—7-in. suction;
8-in. pump cylinders—6-in. discharge,
12-in. stroke.
1—No. 3 Gates gyratory crusher.
1—Single stage American Well Works centrifugal belt driven pump; 5-in. suction—4-in. discharge; normal capacity 500 G.P.M.
1—Swaby centrifugal same as above.
300 to 400 ft. 4-in. and 5-in. pipe.
200 ft. 2½-in. and 3-in. pipe.
1—50-H.P. locomotive fire box type boiler.

All of this equipment in good condition—some used only one short season—offered on account power changed to electricity. Prices on application f.o.b. Riverton, Indiana.

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208 Indiana Trust Bldg. Indianapolis, Indiana

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1—20 hp. Muncie
1—100 hp. Nordberg
1—50 hp. Fairbanks-Morse, type "Y"
1—150 hp. Fairbanks-Morse, type "Y"

Immediate Shipment

MACHINERY & SUPPLY CORPORATION
Dept. 44
Joplin, Missouri

FOR SALE

Two 150 H.P. General Electric Induction Motors, voltage 440, 60 cycle, 3 phase, with starter, complete
Williams No. 9 Universal type pulverizer, complete
Williams No. 3 Hammer Mill, complete
Sturtevant No. 0 Rotary fine crusher
Jeffrey No. 2 limestone pulverizer on trucks with steel elevator

Address E. W. Cooper
174 Third Avenue, North
Nashville, Tenn.

FOR SALE

1—"GATES" 6 x 15 Dry Process ComPeb Mill complete with Chilled Iron Liners, mill arranged for right hand motor belt drive. Purchased September, 1920.

1—"STINE" No. 8 Special Horizontal Type Incline Plane, 6 to 8 ton capacity on 29 degree incline. Purchased February, 1921.

Equipment in EXCELLENT condition. PRICES RIGHT.
Other types of equipment also for sale.

THE STANDARD LIME & STONE CO.
524 Equitable Building Baltimore, Md.

FOR SALE

30 All Steel, Standard Gauge, 12 yard, two way rock cars of very heavy construction. Condition as good as new. Will send photograph on request.

EQUIPMENT SALES COMPANY
Nashville, Tenn.
"Wire us your requirements at our expense"
"If we don't have it we will get it"

FOR SALE

5—Standard Keystone Lime Kilns, capacity 10 ton; practically new
1—No. 1 Williams swing hammer mill crusher—practically new
1—No. 3 new Williams swing hammer mill crusher, with automatic feeder; new, never used
12—All steel, end dump quarry cars, 42-in. gauge; 7 new, 5 slightly used
A number of steel hopper bins and supports
Priced to move quickly

Clinchfield Portland Cement Corp.
Kingsport, Tennessee

FOR SALE

1—Jeffrey type "B" Hammer Pulverizer, size 24x20, 1350 R.P.M. Only used few months to manufacture ground limestone.
1—Foos 150 H.P. 14x14 three-cylinder, vertical type Gas Engine, now operating on natural gas, with drive pulleys and friction clutch; out-board bearings; air compressor and tanks for starting.

Above equipment in excellent operating condition.
Enlarging our plant and will sell at a bargain to quick cash buyer.

THE ABEL MAGNESIA COMPANY
Cedarville, Ohio

For Sale

One (1) No. 0 Raymond Mill with air separator, tubular collector, cyclone collector, and fan, complete.
One (1) No. 0000 Raymond Mill.

Alberger Chemical Machinery Co., Inc.
103 Park Avenue New York City

WANTED

One Clam Shell Derrick complete with boiler, engine, 90 ft. mast, 75 ft. boom, bull wheel, guys, ¾ yd. bucket and tackle.

Reply to MR. ROBERT
Room 604, 177 State St. Boston, Mass.

SPECIAL BARGAINS

Send Us Your Hoist Inquiries

24x36" TRAYLOR JAW CRUSHER
66x86" TRAYLOR JAW CRUSHER
NEW 22x50" JAW CRUSHERS
Model 221 and 250 MARION SHOVELS
Nos. 4-5-6-7½-9 and 10 CRUSHERS
2-DISC CRUSHERS, 36 in. SYMONS, also 24 in.
100 ton, 2½ yd. ELECTRIC SHOVEL
50 to 5000 ft. steam, belt & elec. compressors
13x30 in.; 10x18 in.; 8x14 in. JAW CRUSHERS
24x54, 18x30, McLANAHAN ROLL CRUSHERS
50 HP. D.D. Hoist, 440 V. 3 Ph. motor, Dragline Set. Also 25 HP. Dragline Equipment.
10 and 12 ton ROAD ROLLERS
5-7½ and 10 HP. PORTABLE CONVEYORS
750-1000 Gpm. Underwriters Steam & Motor Driven Centrifugal Pumps, 220-440 V. 60 Cy. 3 Ph.
100 HP. PORTABLE BOILERS—125-150 lbs., $600

Send us your inquiries

Ross Power Equipment Company
Indianapolis, Ind.

1—59-ton standard gauge American 6-wheel Switcher
1—50-ton standard gauge Shay geared locomotive
1—28-ton standard gauge Shay geared locomotive
1—10x16 in., 36 in. gauge, 4-wheel saddle tank
1—30-ton McMyler bucket-handling locomotive crane
1—14-B Bucyrus Steam Shovel, mounted on traction wheels
10—miles 30 and 35 pound relay steel rails, Canton, Mississippi.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

Mine Cars, Rails and Locomotives

We have a number of good, serviceable, standard gauge, second hand locomotives, and narrow gauged ones, for immediate shipment.

M. K. FRANK
Frick Building Pittsburgh, Pa.

WANTED

Jaw Crusher, size not less than 24x36 or over 36x48. Address

The Sandstone Quarries Co.
511 Plymouth Bldg. Minneapolis, Minn.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers. 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York Tel. Cortland 1841

WANTED
Used 12 in. Sand Pump

Direct connected to steam engine, with boiler, if possible, for 70 ft. total head.

Address Box 1719, care of Rock Products
542 South Dearborn Street Chicago, Illinois

FOR SALE

Lincoln Stone Planer, 102 in., 17 ft. bed, 51 in. under head. Complete with electrical equipment, etc. A bargain.

Purchasing Dept., Whiting Corporation
Harvey, Illinois

For Sale—STEAM SHOVEL
⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

FOR SALE

No. 18 Universal Pulverizer. New machine. Has never been in operation. Immediate shipment. Address

Box 1707, Care of Rock Products
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1—70 C. Bucyrus, 2½ yd. Bucket.
1—60 Marion, 2½ yd. Bucket.
Both standard gauge. Immediate shipment.

Consolidated Products Co., Inc.
15 Park Row New York, N. Y.

WANTED

Used Jaw Crusher sufficiently large to take 2½ yard steam shovel size rock.

The Hughes Stone Co., Tulsa, Okla.

Wanted to Buy Rotary Kilns

Prefer 8x110′, or could use larger. Give complete description, location and price.

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One of the best talc deposits in the state of Vermont. Surface talc is remarkably pure, color white or bluish-white, very compact and free from grit. Located 7 miles from R. R. over level state road. The analysis made by the Massachusetts Institute of Technology shows magnesium oxide MgO 30.26. If interested send for complete analysis, samples taken from the surface and report made by Prof. E. C. Jacobs of the University of Vermont. It has taken me 3 years to clear title to the 42 acres covering the deposit. I am now ready for business—a chance for a promoter or a man with capital. Price, cash, $10,000. Address

MINOT A. BEAN
Box 1068, Lowell, Mass.

For Sale

Limestone Quarry, 200-Ton Capacity, in Central Iowa. In good condition and operating every day. Priced to sell. Address care this paper.

Box 1717, care of Rock Products
542 So. Dearborn St., Chicago, Illinois

LIME PLANT SUPERINTENDENT

Have good position in West for first-class experienced all-around lime plant and quarry superintendent. Requirements are knowledge of lime burning—firing, operating, hydrating plant—quarrying—construction—general repairs—shipping, and handling of men; capable of managing entire plant under general orders from city office. Rapidly growing business. Also have position for plant foreman. State fully experience, qualifications and salary expected. Address

Box 1715, care of Rock Products
542 South Dearborn Street Chicago, Illinois

WANTED

An experienced quarry operator accustomed to volume production, and having about $50,000 capital. An unusual opportunity for the right man. Address

Box 1720, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WHITE CRYSTAL MARBLE QUARRY AND MILL FOR SALE—IDEAL MARBLE FOR STUCCO DASH

A fully developed White Crystal Marble Quarry and Mill in New York State. Quarry contains 65 acres, all marble. This quarry is exceptionally sound and uniform in color and the white crystals in it make it most desirable for Stucco Dash. The equipment is complete for both quarry and mill. Reason for selling, have many other large contracts and cannot give this one my time. Address answer,

Box 1713, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR SALE

Complete crusher plant, consisting of No. 7½ and 5 gyratory crushers, 15x20 engine, 66x16 boiler, pumps, water heater, air compressor, stone elevator, screens, steel quarry cars, rails, drills and all tools. Attractive price for removal or operation at present location. Can be seen in operation.

Bodine Stone Co. Buffalo Station, Va.

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

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IDEAS—

You could use an idea now and then, couldn't you?
You'll find plenty of new ones, short cuts and time savers in ROCK PRODUCTS.

Our traveling editors are running around, dropping in here and there finding out just how things are done, and then they tell you how the other fellow makes things hum.

Practical stuff—tested ideas—something *you* can use
Better fill out the blank and mail it to us today

ROCK PRODUCTS Date.....1922
542 So. Dearborn St., Chicago, Ill.

Please enter my subscription to ROCK PRODUCTS for.....year.... (one year $2.00, two years $3.00—please state which. You save a dollar by subscribing for two years), for which we enclose $..... Canadian and Foreign Subscriptions $3.00 a year.

Name.....

Street.....

City.....State.....

We produce:.....

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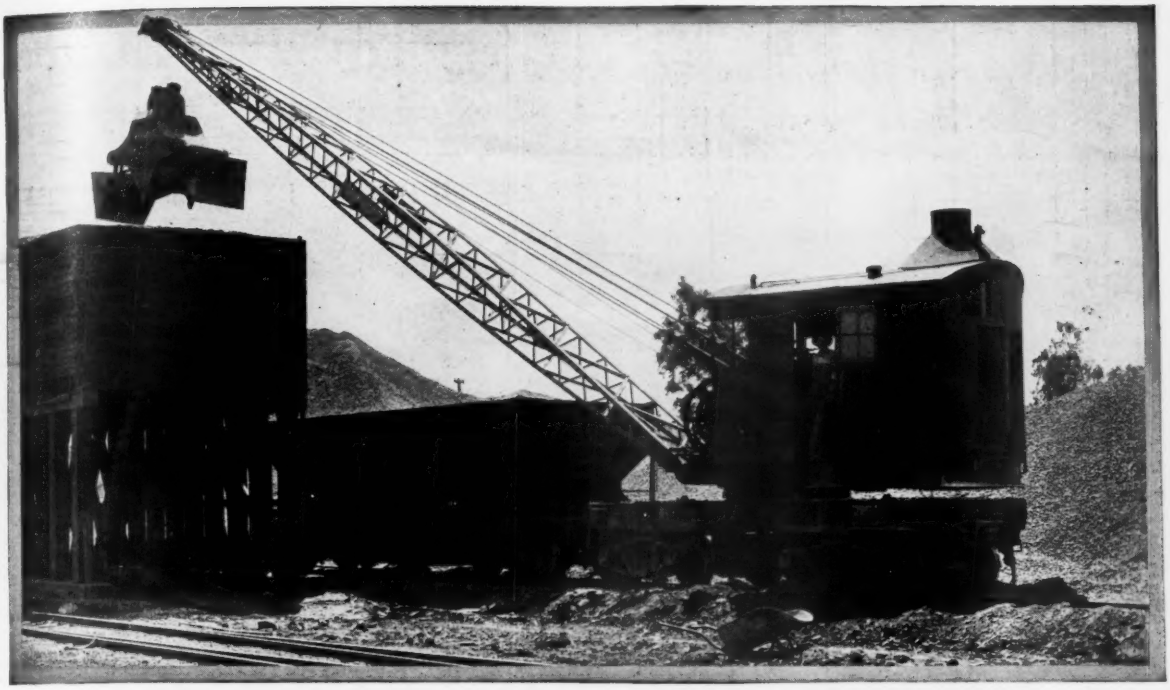
We retail.....



"Brownhoist Cranes are Unsurpassed"

Brownhoist builds cranes, buckets, chain and belt conveyors, bins and other handling equipment. The cranes are mounted on creepers or 8 or 4 wheel railroad trucks and are powered by gas engine, steam or electricity.

"Our company has used several makes of locomotive cranes and we know by comparison that the Brownhoist is not surpassed by any other," says the Franc Slag Company. This company operates many slag and stone crushing plants in Ohio and Michigan and have used Brownhoist cranes for years.

The Brownhoist at their Toledo plant handles an average of 500 tons of slag a day at a cost of 4 cents per ton. Besides its regular work of handling crushed slag this Brownhoist does all kinds of odd jobs around the plant.

With the increasing cost and difficulty in getting labor the money-saving possibilites of a Brownhoist are worthy of your careful study. Write for a copy of catalog K and let us go into your problem with you.

The Brown Hoisting Machinery Co., *Cleveland, Ohio*

Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans

BROWNHOIST

MATERIAL HANDLING MACHINERY

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation
542 South Dearborn Street, Chicago, Illinois

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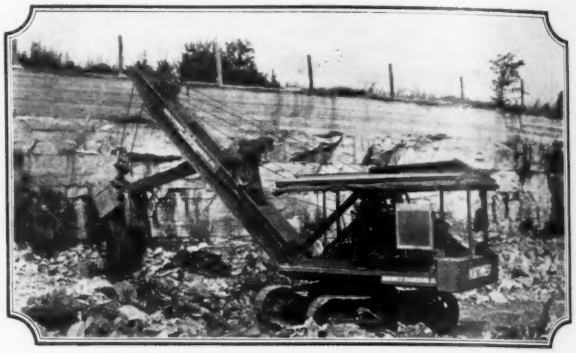
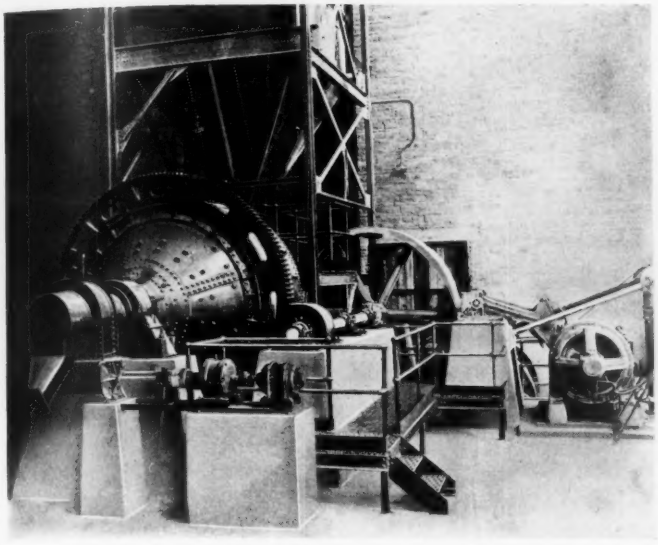
Why the Northwest
is the choice of Quarrymen



Quarrymen have found an answer to their digging problems in the Northwest. But greater than this—they have found relief from the annoying attentions necessary with steam machines. The Northwest brings even steady power and constant operation without stops for taking water. It eliminates the hoseline and the troubles that it brings in freezing weather. It does away with the extra help required in handling coal, cuts operating costs and speeds up the work.

Northwest Engineering Company
1234 Steger Building
Chicago, Ill.

NORTHWEST
GAS or CRANES · SHOVELS · DRAGLINES ELECTRIC



Golden Cycle Orders a 10-ft. diameter Hardinge Ball Mill

To Replace Smaller Units

This is the largest grinding mill built.

Six of these same mills were used by the Government to grind carbide, one of the hardest and most abrasive of all materials.

The Canada Cement Company also installed a similar mill to grind cement clinker.

The efficiency of this huge unit, as compared with the average size mill is in the ratio of 1½ to 1, with very much greater capacity. This means a saving of a good many thousands of dollars per year to the user.

Why not put your case before us?

We base our recommendations on fact, not guesswork.

HARDINGE COMPANY

WORKS: YORK, PENNA. MONTREAL, QUE. BERTELING.

120 BROADWAY, NEW YORK, N.Y.

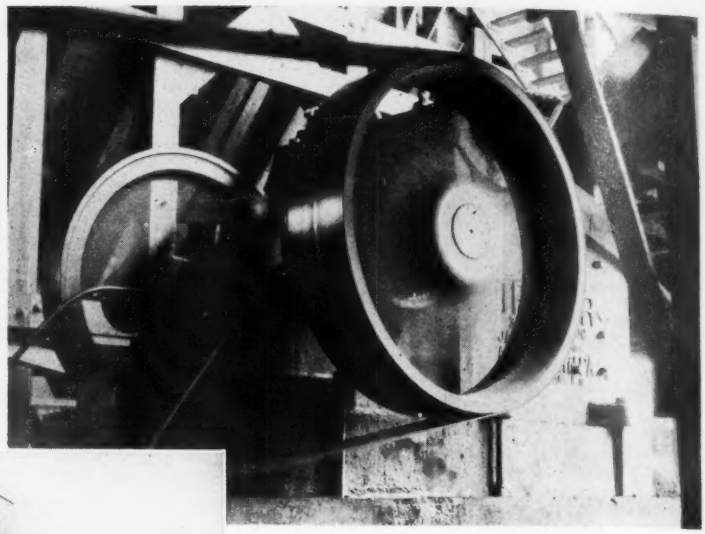
BRANCH OFFICES: SALT LAKE CITY, UTAH: NEWHOUSE BUILDING LONDON, ENGLAND: 11 SOUTHAMPTON ROW

CABLE ADDRESS: HARDINGECO, NEW YORK

Hardinge Conical Mills

ENDURINGLY EFFICIENT

TRAYLOR
"BULLDOG" JAW CRUSHER



The 36" x 48" Bulldog Jaw Crusher

An Installation
At the Ohio Valley Rock Asphalt Co.'s New Plant Summit, Ky.

All crushing and grinding units at the recently completed Ohio Valley Rock Asphalt Company's plant were manufactured by us.

The initial breaker is a 36x48-in. BULLDOG jaw crusher, fed by a 48-in. x 14-ft. Sheridan Grizzly Feeder. The crusher is set to discharge at 5½-in. A 54x30-in. Type AA roll with renewable high carbon cast steel shells reduces all materials to 1½-in. It is then carried to two 54x24-in. finishing rolls, also of our standard AA type, equipped with fleeting roll, where it reduces the material to 5/16-in.

Traylor equipment always fills the bill. No operation is too big, and none too small for economical use of Traylor crushing and grinding equipment.

Ask the Nearest Traylor Man for Bulletins 99R and RZR

TRAYLOR ENGINEERING AND MANUFACTURING COMPANY
ALLENTOWN, PA.

NEW YORK 30 Church St. | PITTSBURGH 1309 Fulton Bldg. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES I. W. Hellman Bldg.

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International Machy. Co. SANTIAGO, CHILE | W. R. Grace & Co. LIMA, PERU | International Machy. Co. RIO DE JANEIRO, BRAZIL

When writing advertisers please mention ROCK PRODUCTS

KENNEDY BALL BEARING GEARLESS CRUSHERS

The exceptional crushing records that are being made by Kennedy Gearless Crushers on every sort of rock, from soft material to the hard compact quartzites, are worthy of study by every mining engineer interested in lower milling costs.

Kennedy Gearless Crushers stand out in service.

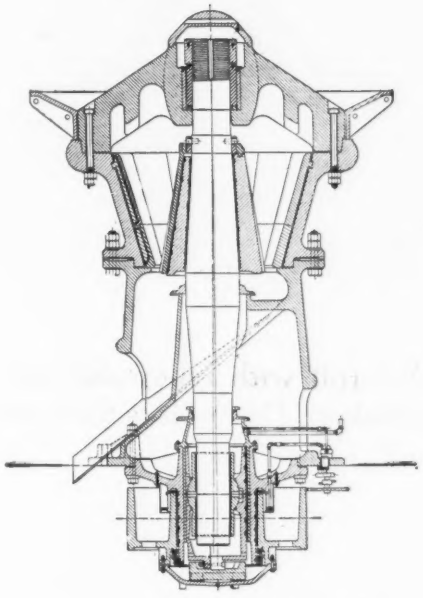
They run for years with practically no attention and have 50% greater capacity for the same power consumption.

They are quiet in operation; and the positive circulating oil system, self aligning ball and socket eccentric and many other friction-reducing features insure complete freedom from overheating.

Kennedy Gearless Crushers have a short shaft specially reinforced with self-locking head so that it cannot break where 90% of the shaft breakage usually occurs in other crushers.

Kennedy Gearless Crushers are designed for long hard service. Ask the men who run them—and send for our latest bulletins.

PRIMARY CRUSHER



Made in two types for Primary and Secondary Crushing.

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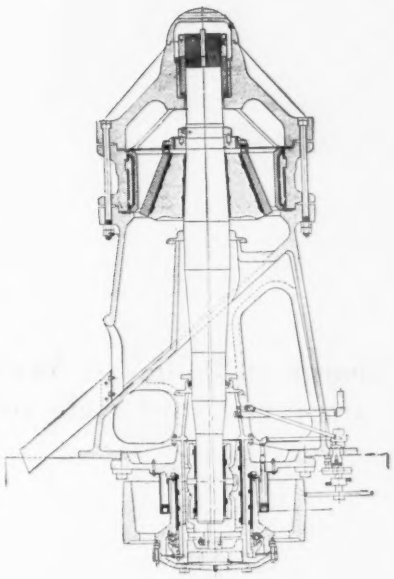

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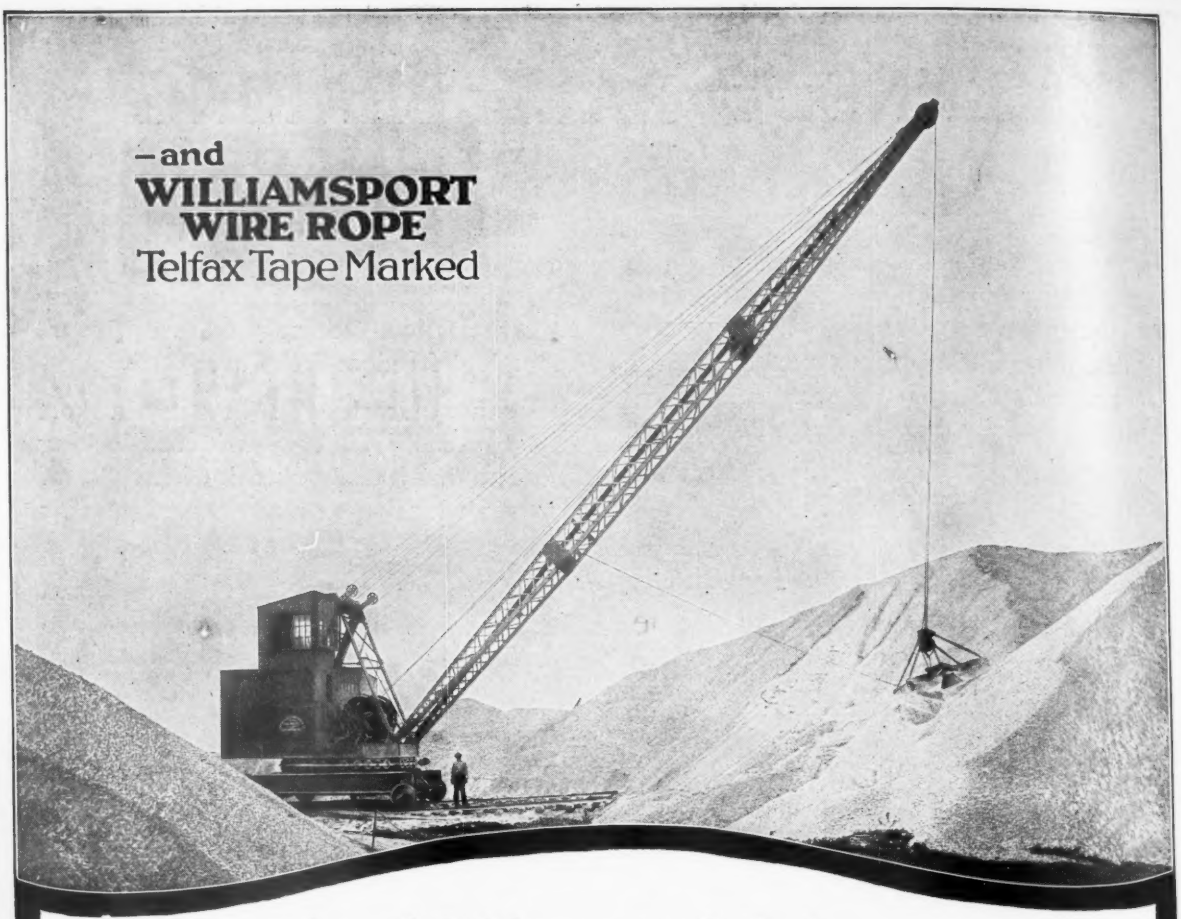

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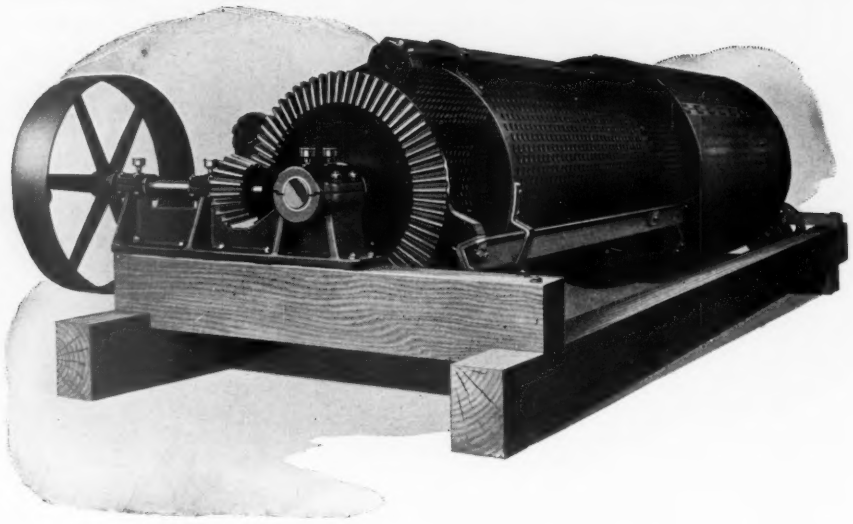

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Lump material sinks down into this cushion, snug and safe there, like a babe in a great, big feather bed.

Thus, your mill turns and turns, wasting half its energy. The grinding process is only half effective. You pay double for what you get out. And that's because the cushion of powdered particles always resists the grinding process, always slows it up, always reduces your output and your profit.

The mouse stops your elephant.

This is not the fault of your mill. If you will eject the powdered material and give the mill a chance, the same mill will do twice the work it is now doing and you will get 100% more output and more profit.

Can it be done? It can. It is being done in many plants in America today, as never before, with the aid of that remarkable producer of bigger outputs and bigger profits—the HUM-MER.

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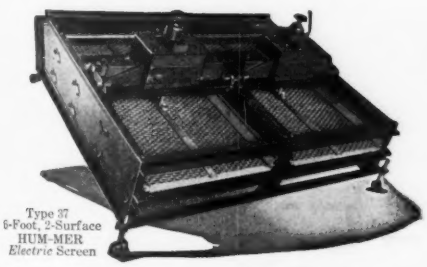

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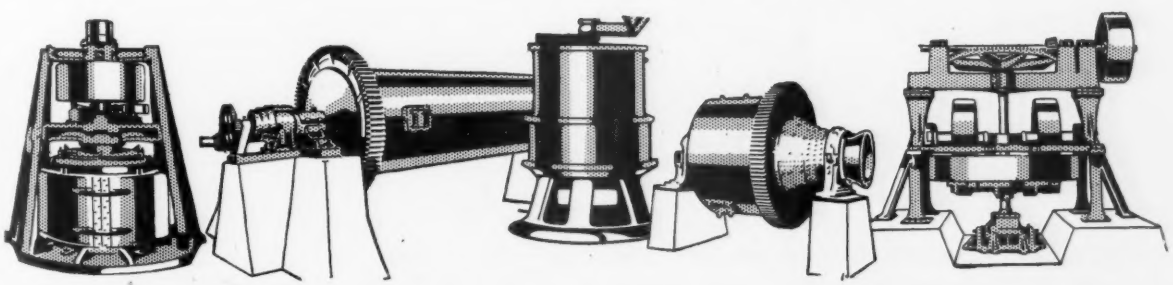

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Again We Say "Boom and Hoist"

COMBINING of these two operations into one simultaneous operation instead of two "stop-and-go" operations means speed in handling materials — a greater ability of the Koehring to work in closer quarters and under a broader range of conditions. "Boom and Hoist" is a distinctive Koehring feature in that the Koehring is *designed* for this combination operation, and inflicts no penalty of excessive wear.

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Crane Excavator Capacities

No. 2 Capacity: 12 tons at 12′ radius. ½ yard clamshell bucket loaded with sand or gravel at 45′ radius. ¾ yard clamshell bucket loaded with sand or gravel at 39′ radius. 1 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard clamshell bucket loaded with sand or gravel at 24′ radius. 1 yard Page drag bucket on a 40′ boom.

No. 3 Capacity: 20 tons at 12′ radius. 1 yard clamshell bucket loaded with sand or gravel at 50′ radius. 1½ yard clamshell bucket loaded with sand or gravel at 39′ radius. 2 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard Page drag bucket at 40′ radius.

No. 1 Capacity: Equipped with 30′ boom. Handles ¾ yard bucket at 25′ radius; lifting capacity at 12′, 14000 lbs. 4 cylinder 5″x6″ gasoline engine.

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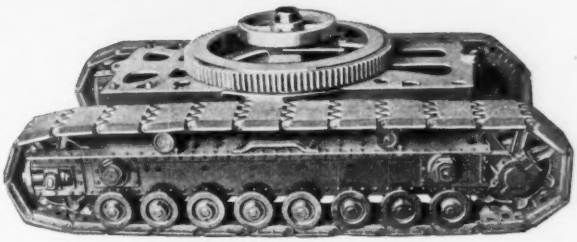
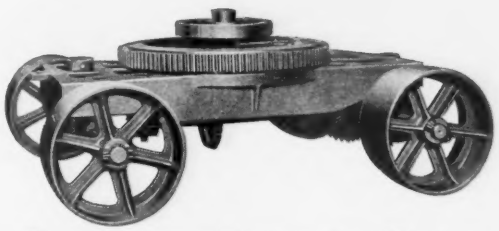
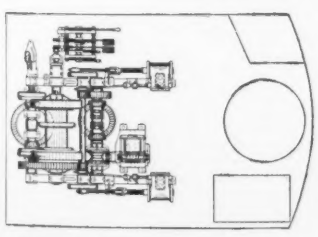


Crawler—Because of its ability to carry the No. 2 crane unhesitatingly over uneven ground, through sand and mud, up grade and down, the crawler type mounting is universally favored by highway and construction contractors as well as by owners of sand and gravel pits and retail coal yards.

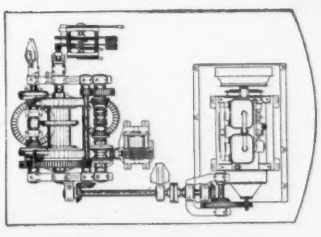


Tractor—Where suitable ground conditions are assured, the tractor wheel mounting is recommended. Both the crawler and the tractor cranes are steered by the operator from the cab without a ground man to throw clutches or to connect chains or links.

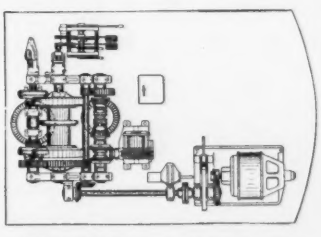
Railroad—For plants equipped with railroad tracks, this railroad carbody is preferred. The tractive effort is sufficient for shifting loaded cars. Standard equipment includes brakes acting on all four wheels. This carbody may be had in standard, narrow and wide gauge types.



Steam—The steam crane is driven by a two-cylinder, horizontal, non-reversing engine. The boiler is amply large, 150 lbs. working pressure, A. S. M. E. code.



Gasoline—A 70-H. P. Climax engine furnishes power for the gasoline crane. Standard equipment includes Perfex radiator, high tension magneto, governor, and large capacity gasoline tank.



Electricity—Under certain conditions electrical operation is desirable. The No. 2 crane is adapted to various types of motors taking current through convenient plug-in pockets.

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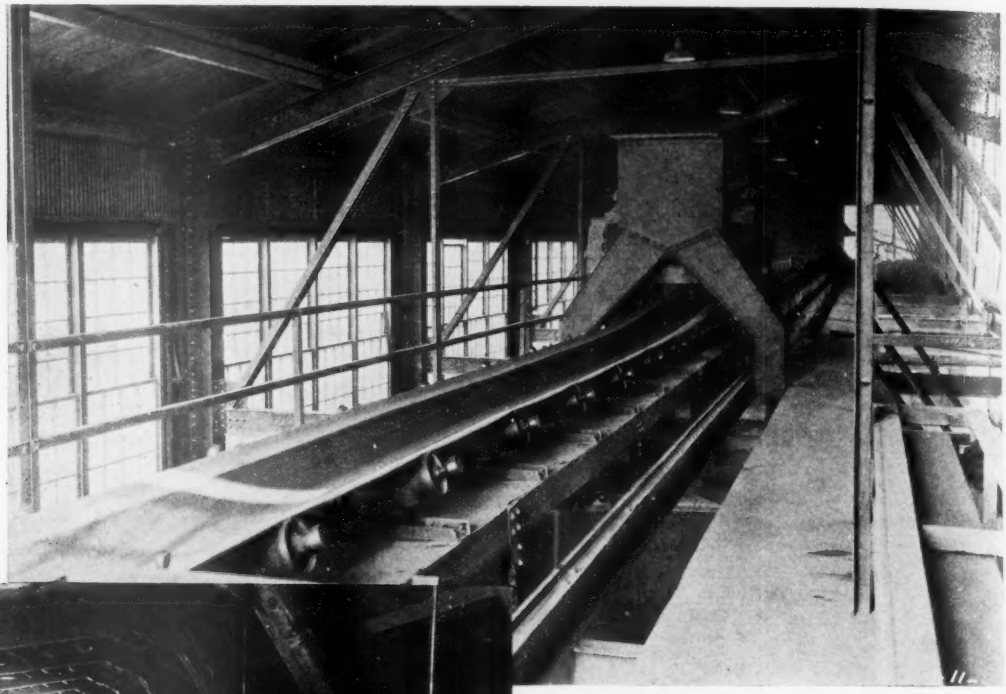

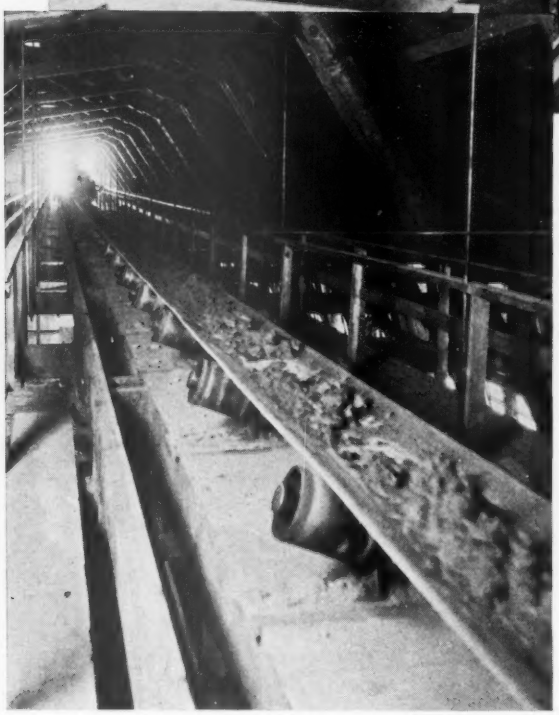

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